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## THE PRIME MATTER OF PARACELSUS

By Walter Pagel*

No Paracelsian concept stirred up the minds of the Paracelsians and their adversaries as much as that of *Prime Matter*. It is still one of the main stumbling blocks to our understanding of Paracelsian ideas. In a previous paper[1] we discussed some of these difficulties and the inconsistencies which appeared to result from them in Paracelsus' *Hermetic* philosophy and cosmology. In this respect we considered the question as to whether Paracelsus (1493–1541) believed in *creation* or in *preformation* of matter without, however, arriving at a clear-cut answer. It still remains to attempt a more detailed examination of Paracelsus' concept of *Prime Matter*—in the hope of clearing up some of the contradictions and thereby of deepening our understanding of his ideas.

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[1] W. Pagel, *Paracelsus and the neo-Platonic and Gnostic Tradition*, *Ambix*, 1960, **8**, 125–166.

## I

### Prime Matter of the World

*What is the Prime Matter of Paracelsus?* To answer this question it may be expedient to present two passages which appear to be of first importance:

The first comes from one of the main works—the *Opus Paramirum* of 1531. In this we are given a cross section through Paracelsus' philosophy and medicine, conceived and matured during his best years. Here it says: "since the *prime matter of the world was the* Fiat, who will dare to explain the *Fiat*? We have, however, some foothold through the fire of *Vulcan* whereby we can explain the *Three Principles* . . ." ("dieweil aber prima materia mundi fiat ist gewesen, wer wil sich unterstehen das fiat zu erklären? nun aber etwas haben wir durch das feur vulcani, dadurch wir die drei ersten erklären . . .")[2].

The second passage is also derived from one of the most incisive and genuine works although this belongs to a late period and is aphoristic rather than systematic in scope—the *Labyrinthus Medicorum* of 1537–38. Here it says in the fifth chapter on chemistry (*alchimei*) and its necessity for the physician: "God created all things, something from nothing. This something is a seed; the seed contains the end of its predestination and office. And . . . there is nothing that is created in its final form, but *vulcan* must complete it . . . all things are created as *prime matter* and after that the *vulcan* follows and turns them into *ultimate matter* through the art of alchemy" ("got alle ding beschaffen hat, aus nichts etwas—das etwas ist ein sam, der sam gibt das end seiner predestination und seines officii, und wie von nichts bis zum end alle ding beschaffen seind, so ist doch nichts do, das auf das end gar sei, das ist, bis auf das ende . . . sonder der vulcanus muss es vollenden . . . das nichts gar beschaffen ist in die ultimam materiam, aber alle ding werden zu prima materia beschaffen, und über das folgt der vulcanus hernach, der machts in ultimam materiam durch die kunst alchimiae . . .")[3].

In these two passages the term *Prime Matter* is used in *different meanings*. The first speaks of the *Prime Matter of the World* and the second of the *Prime Matter of Individual Objects*.

[2] *Prima Materia Mundi* was *Fiat: Opus Paramirum*, I, cap. 2, ed. Sudhoff, vol. IX, p. 48.

[3] All things created from nothing: *Labyrinthus Medicorum*, cap. 5, ed. Sudhoff, vol. XI, p. 187. Compare the relevant passages cited by Pagel, *loc. cit.* (in footnotes 59, 64, 67), pp. 142–145.

It may be noted in passing that this passage from the *Labyrinthus Medicorum* belongs to the Paracelsian sayings collected by the young Goethe in his *Ephemerides* (*Gesammelte Werke*, Grossherzog Wilhelm Ernst Ausgabe, vol. XII: Aufsätze zur Kultur-, Theater- und Literaturgeschichte, I, Leipzig, 1920, pp. 7 *et seq.* (1770): "Paracelsus sagt, Gott habe alle Dinge aus nichts erschaffen in Labyrintho Med., cap. 5").

The *Prime Matter* of the *World as a whole* is the *word*: *Fiat.* It is therefore not matter in the modern sense—at all events not to begin with. The idea of founding the world on the *word* is reminiscent of the *Prologue* to the *Fourth Gospel*: In the Beginning was the Word. This allusion is strengthened by a further passage from the *Book on Minerals*, an early work, which we give in full: "the first was *with God*, the beginning, that is *ultima materia*; this *ultima materia* He made into *prime matter*. As fruit that is to yield other fruit has seed, the seed is in *prime matter*. Thus *ultimate* matter of the minerals is made into *prime matter* that is a seed and the seed is the element of water" ("Nun ist das erst gewesen bei got, der anfang, das ist ultima materia, die selbige ultimam materiam hat er gemacht in primam materiam. als ein frucht, die ein ander frucht sol geben, die selbige hat ein semen: der sam ist in prima materia also ist nun der mineralium ultima materia in ein primam materiam gemachet, das ist in ein sam und der samen ist elementum aquae . . .")[4]. The object of this passage is to convey that God created water as the *matrix* ("mother") or *seed* of minerals and metals. This created water, however, was not primeval matter. This is here called *ultimate matter* and "was with God".

Again the allusion to the Fourth Gospel is obvious. What is said in the latter about the *Logos*, namely that it was in the beginning and *with God*, is here said about *Prime Matter*. Primeval matter from which the world was built indeed corresponds to the Logos of the Fourth Gospel—this seems to be an idea advocated by Paracelsus at least in the two passages given. It serves to emphasize that *prime matter* is no matter in the ordinary sense, but a Logos, i.e. an immaterial spirit that existed by itself—substantially—in the beginning.

The passage from the *Book on Minerals* is also significant for the explicit distinction made between *primeval matter*—here called *ultimate matter*—and the *prime matter* of individual objects, in this case of minerals and metals. Indeed the world began with *ultimate matter* and it is the latter into which material objects will be dissolved in the end.

*Qua Word*, primeval matter is *not* represented as *created*, but it steps out from God as the initiation of Creation, or as it is expressed in a reputedly spurious work, only thereafter was "the word *Fiat* made material, apprehensible, and a body in which there lies and is hidden all that is predestined". It is out of *first matter* as an *Iliastrum* that the *Three Principles*: Salt, Sulphur and Mercury, emerged[5].

[4] The first was *with God*: *Das Buch De Mineralibus*, ed. Sudhoff, vol. III, p. 34. See also: Pagel, *loc. cit.* (footnote 60), p. 142.

[5] The *Word Fiat* made material: *Liber Azoth*, cap. 1, ed. Sudhoff, vol. XIV, p. 549.

The *Iliastrum*, then, is *Logos* and the meanings which have been attributed to the *Logos* of the Gospel should appertain to it[6]. Thus the divine *Logos* is not simply the uttered word. It is a "rational content of thought corresponding to the ultimate reality of the universe" (Dodd) and in a certain sense connotes *Law in Nature*[7]. As such the *Word was*, i.e. existed substantially add not merely was spoken. It so exists as a hypostasis distinguishable from Gno and yet it remained with Him[8].

The next stage, according to the gospel, is the manifestation of God's word in Life and Light, followed by the *Logos* becoming flesh. Similarly Paracelsus visualizes the materialization of the pure spirit as the next stage—"how the word Fiat became material". This was through the emergence, in the—spiritual—Iliastrum, of the *Three Principles* (*Tria Prima*)—Salt, Sulphur and Mercury[9].

[6] For this the dissertation on *Logos* in C. H. Dodd, *The Interpretation of the Fourth Gospel*, Cambridge, 1953, part II, cap. 12, pp. 263–285, should be consulted.

[7] *Logos*: Law in Nature, see Dodd, *loc. cit.* (footnote 6), p. 263. *Logos* as the ultimate reality of the universe, *ibid.*, p. 267.

[8] *Logos* as hypostasis: Dodd, *loc. cit.*, pp. 264 *et seq.* (p. 269).

[9] *Fiat—Iliastrum—Three Principles: Liber Azoth*, cap. 1, ed. Sudhoff, vol. XIV, p. 549. The idea that the *Three Principles* emerge from the spiritual *Iliastrum* as *Prime Matter* was attributed by Andreas Libavius (ab. 1540–1616), in *De Universitate et Originibus Rerum Conditarum*, Francof. a. M., 1610, pp. 76–78 to the *Archidoxis Magica*, a Paracelsian treatise which "deserves not the light of the sun, but that of eternal fire". In it the *Iliastrum* is said to be the prime matter from which sulphur, salt and mercury were created. We are thus to understand how the word *Fiat* was made material, apprehensible, and a body in which all things are predestined and hidden and then brought out—from the *Iliastrum* through the activity of the *Cagastrum*. This, according to Libavius, means that when God said *Fiat* this word was converted into prime matter, as it were the "demon or spirit of matter". It contains the essential principles of all things each of which assumes at its time appointed by God (divina praefinitione) the *ratio et proportio* of its nature, i.e. is generated and in the beginning created. The *Cagastrum* is also called *Cogastrum*, an *astral* power that *forces* the things that are preformed in an ideal image to step out as natural objects—just as bodies dissolved in water are condensed and solidified by the action of heat and an astral force specific to each object. In Libavius' opinion this doctrine of preformation amounts to a denial of creation—which would merely mean *in yliastro praedestinatum pridem, ex eodem proferre* and that with the assistance of a *Cogastrum*. It is ridiculous that the word *Fiat* should have become "that material and apprehensible body". Why is this not immediately stated where it says that God made heaven, earth, air, water and darkness? To connect this *Fiat* with the mystery of God's son who was begotten from eternity and thus to explain his incarnation is a capital crime, insinuating an analogy between generation through the eternal word and the creation and generation of nature.

These latter are also spiritual rather than material in the common sense—they are the spiritual directors of matter towards the fluid-smoky state (mercury), the inflammable-fatty state (sulphur) and the solid-crystalline state (salt). In this triade sulphur performs the function of the principle uniting two opposites, the "soul" that joins spirit (mercury) to matter (salt)[10].

The materialization of the *Fiat* is thus described in the *Liber Azoth*, a treatise not normally recognized as genuine—probably because of its high-flown speculative and difficult contents. Here we are also told that the spirit of God hovered on the water and carried the Word of God on to it. Thus this water became a matrix—*living* water that is, not *visible* water, but the Word of God that is invisible to the *cagastric*, i.e. bodily eye (in contrast to the internal eye). Or more explicitly, the Word of God became flesh and was *heavenly flesh*. The *Word* of God also brought about the *Fiat* and endowed the soul of the greater world with imagination. Hence the watery matrix and soul became pregnant and gave birth to *earthly flesh*, i.e. matter in the modern sense[11].

In *De Pestilitate*—a treatise often bracketed together with the *Liber Azoth*—the story of the materialization of the word *Fiat* is taken further: Through the *Fiat* first water was created and then from water all other creatures. Water was also the matrix of the *Tria Prima*—which are properly called Sulphur, Mercury and Salt and which are the origin of the elements and the true *materia* from which all animals and mankind were created[12]. This is also found in the *Great Surgery* of 1536 where it is written that "the three things are the prime

[10] *Three Principles*—spiritual: see W. Pagel, *Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance*, Basle & New York, 1958, p. 86; and *Ambix*, 1960, *loc. cit.* (footnote 99), p. 154.

[11] *Word* was *heavenly flesh: Liber Azoth*, ed. Sudhoff, vol. XIV, p. 570; *ibid.*, cap. 2 (De Manna. Vom Engelbrot), p. 589.

The Paracelsian distinction between *living* water and *visible* water as given in the *Liber Azoth* invites comparison with the *male*—active—waters and the *female*—receiving—waters as distinguished by the *Kabbala* and used as designation for the waters which were above and under the firmament (Gen. I, 6 and 7). The former are called *Elohim* and the latter *Adonaj* "and thus the name *Elohim* spread over all things, as the male waters (the active powers) were consummated in the female waters (the receiving powers)". *Die Geheimnisse der Schöpfung. Ein Kapitel aus dem Sohar*, von G. Scholem, Berlin, 1935, p. 64.

On the emergence of the gnostic idea of the "heavenly flesh of Christ" in the work of Paracelsus, Sebastian Franck, Michael Servetus and others, see: H. J. Schoeps, *Vom Himmlischen Fleisch Christi*, Eine dogmengeschichtliche Untersuchung, Tübingen, Mohr, 1951, pp. 54–56.

[12] Through *Fiat*-water created; water as *matrix* of the *Tria Prima*, i.e. the true *materia* from which elements, animals and mankind were created: *De Pestilitate* (sub: Cabala), ed. Sudhoff, vol. XIV, p. 601.

matter of all creatures, also their ultimate matter, the beginning, middle and end of each body"[13].

The word *Fiat*, however, is not limited in its activity to the first creation. It is still alive to-day. It is the *Fiat* which is still present in all things, for the Word of the Lord is the Kingdom of God. Thus it forms the *food* of the "aquastric body", i.e. the ideal pattern of an individual body. It comes to the material body—the "cagastric homunculus"—through the "Mercury of Life"—for this contains the Word of God which once went from His mouth and still issues from it. Accordingly, the Body of Christ—the "heavenly Aquaster" —is called "celestial manna", i.e. the food of the soul[14].

*Looking back* to what we have said we would *conclude* that in the Paracelsian view

(1) *Prime Matter of the world* as a whole must be distinguished from the *Prime Matter of the individual objects.*

(2) *Prime Matter* of the world is not matter, but spirit—in fact it is the Word *Fiat*, the *Logos* of the Fourth Gospel, the Platonic archetype and ideal pattern of the world that is to become a material creation.

(3) As such it is also called *Ultimate Matter*, reserving the term *Prime Matter* for the individual objects in their original state.

## II

### Prime Matter of the Individual Objects

What, then, is the position of *individual objects*? Paracelsus emphasizes that they were created by God[15]. This creative act appertained, however, only to their original state. They were then left to be developed by their immanent "blacksmiths"—the vulcans and archei—each developing at the appointed

[13] Zweites Buch der *Grossen Wundarznei* (1536), tract. II, cap. 3, ed. Sudhoff, vol. X, p. 292—*Tria Prima* are *prime* and *ultimate matter* of all creatures.

[14] *Fiat* permanently active: *Liber Azoth*, cap. 2, ed. Sudhoff, vol. XIV, pp. 557–560 and 568–569.

[15] In Paracelsus' view *creation from nothing does not apply to man.* He says: "first that God created all things from nothing, merely through the *Word*; not, however, man whom He made from something, i.e. from a *massa* which had been a body, a substance and something . . . an extract from all creatures in heaven and earth . . . all elements and all stars . . . that which had been the most subtle and best . . . whence it follows that man is the lesser world . . . earth being man's flesh, water his blood, fire his warmth, air his balm"—*Ein Mantischer Entwurf* (?1536, Munich), ed. Sudhoff, vol. X, p. 648. The idea is reminiscent of *Raschi* to *Genesis* I, 27 ("so God created man in His own image"): "sch'hakol nivra

time, when it is destined to reach its "monarchy" and then involuting and returning to *ultimate matter*.

The original state of the individual object, the state in which it was created, is its *prime matter*. We are told that this is its *seed*[16].

Finally the term *prime matter* loses much of its original meaning and simply denotes any raw material which is converted into a finished product ready for human consumption through the offices of a craftsman, artisan or chemist. Thus grains of wheat are the *prime matter* of bread, made into secondary matter by the baker and becoming ultimate matter when eaten and converted into flesh[17].

[16] *Seed*—the *prime matter* of individual objects: *Labyrinthus Medicorum*, cap. 5, ed Sudhoff, vol. XI, p. 187. *Das Buch De Mineralibus*, ed. Sudhoff, vol. III, pp. 33–34.

[17] *Prime* and *ultimate matter* of bread: *Labyrinthus Medicorum*, cap. 5, ed. Sudhoff, vol. XI, p. 188. See also: *Paragranum*, tract. III, ed. Sudhoff, vol. VIII, p. 181.

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[15] *continued.*

b'maamar w'hu nivra b'jadajim"—as everything was created by the mere word, man, however, by hands—with reference to Psalm 139, v. 5: "wathascheth alaj cappechah"—Thou hast laid Thy hand upon me. On this the present author is indebted to Mr. Raphael Loewe for the following note: "The source is: Alphabeth of R. Akiba, 2nd Recensio, ed. A. Jellinek, *Beth ha-Midrasch*, part III, p. 59. L. Ginzberg, *The Legends of the Jews*, V, p. 63, n. 3, cites no other Rabbinic sources but very many Christian ones, from the Clementine *Homilies*, Tertullian, etc., onwards. He concludes: The statement which emphasizes the fact that man is the creation of God's hands is probably directed against the doctrine of Philo and the Gnostics who maintain that Adam was partly or wholly created by the angels; comp. n. 14. It is noteworthy that Philo de Somn. 1, 36, emphatically asserts that 'man was not made by hand, but is the work of invisible nature' ".

In a personal communication to the present author Professor G. Scholem mentioned the following implicitly additional Rabbinical sources: *Bereshith Rabba*, Parascha 24, Parag. 5; *Pesikta Rabbathi* 47, ed. Buber 190a and *Zohar*, II, 75b.

For the connexion of the creation of man with his *microcosmic* nature a passage from the *Hermetic Corpus* (XIII, De Regeneratione, 11, ed. Nock and Festugière, vol. II, p. 205) may be mentioned. Here the divine "powers" (*dynameis*), i.e. the divine *logos*, are said to be imparted on regenerated man—expressing intimate unity with God in terms of metaphysical pantheism. Thus regenerated man feels the universe to be in himself and himself to be in heaven, on earth, in water, in air, in animals, in plants (see also XI, 20, *loc. cit.*, vol. I, p. 155, and C. H. Dodd, *The Interpretation of the Fourth Gospel*, Cambridge, 1953, p. 190). Union with the Universe that is in God—a rebirth of man *qua* microcosm—was one of the essential motives in Paracelsian metaphysical pragmatism, recognizable for example in his treatises on *Long Life*.

## III

### Was Prime Matter Created? The Views of R. B. (Robert Bostocke, 1585)

Paracelsus' reputed belief in either the creation or the pre-existence of *prime matter* agitated the minds of the Paracelsians and their adversaries. Among the latter, Erastus in particular hurled ferocious invectives at Paracelsus, whom he accused of having revived Gnostic heresy in this field.

Can we derive any information relevant to this question from our discussion?

First it would appear that Paracelsian *Prime Matter* should not be confused with the "dark abyss" of primeval waters which according to *Hermetic* and *Gnostic tradition* were visualized as the embodiment of uncreated evil separate from and opposing divine goodness, as it were, from outside. It will be shown below that this difference implies no exclusion of an ideological connexion of the Paracelsian *Prime Matter* with *Gnosticism at large* (*vide infra*, in *Epilogue*). Here it may suffice to say that Paracelsus, too, believed in water as the universal *matrix*. This was the receptacle of the *semina*[18]. The latter derive not from water, but from the *Iliaster* (*Limbus, Mysterium Magnum*) which is not material but the ideal archetype of the world and hence something spiritual. Indeed it corresponds to *Logos* and dwells *with God*. Admittedly, like *Logos* it was not created—it rather formed an aspect of divinity though at the same time assuming a substantial existence distinguishable from God. In some ways this may be regarded as reminiscent of the Gnostic view that *prime matter* is uncreated, but still remains removed from the idea of *prime matter* pre-existing outside and separate from God, as represented in some Gnostic philosophies.

If, in Paracelsus' view, *Prime Matter* forms part of divinity this is not incompatible with its pantheistic interpretation in the *Philosophia ad Athenienses*. This treatise has been regarded as an unauthentic document expressing heretical thoughts and it provided the enemies of Paracelsus with much of the evidence against him[19]. In it the "*Mysterium*" or "*Mother*" (*Matrix*) assumes a position of central importance, as in it all objects of nature are generated. This *mysterium* is *uncreated* and *separation* rather than *creation* provides the fundamental pattern of all birth and generation. The

[18] Water—the receptacle of the *semina: Opus Paramirum*, lib. IV, *De Matrice*, ed. Sudhoff, vol. IX, p. 194. Compare the characteristic spiritualist version of the idea that water is matrix in the *Liber Azoth* (ed. Sudhoff, vol. XIV, p. 570 and 589) and its kabbalistic parallel as quoted in footnote 11 above.

[19] *Philosophia ad Athenienses:* see W. Pagel, *Paracelsus*, 1958, *loc. cit.* (note 10), pp. 89 *et seq.*

*Mysterium* of the *Athenienses* may well be compared with the uncreated *Word Fiat* of the *Opus Paramirum*—both representing the *Prime Matter of the World* and both striking the searching mind as an unapproachable secret. Hence the name of *mystery*, prominently used in the *Philosophia ad Athenienses*, though the emphasis laid on separation rather than creation seems to be at variance with some of the classical loci that deal with the coming into being of individual objects.

The view concerning the original ideal pattern of the world, the *Iliastrum*, follows, then, a pantheist rather than a dualist trend. In this it is consistent with Paracelsus' idea of the *Arcana*. These are the virtues immanent in individual objects, carrying the specific power of each. As such they are immediately divine, *uncreated*, prior to all things created including heaven and earth and stepping out from divinity at a time when God was a spirit and hovered on the waters[20]. It is tempting to see the origin of this concept in the *Hermetic Poimandres*. Here the ideal archetypal world preceding the sensible world is the luminous realm of the powers—*dynameis*, the product of the organization of aboriginal *Light*[21]. The emergence of the latter is the first phase in the formation of the world in the original *Nous*. The *dynameis* are represented as radiations of light and the cosmic forces through which God creates the world—just as the *Logos* is the sum of emanations from the eternal *Nous*. These forces are imparted to man in the form of ethical qualities—just as the *Logos* in man is the expression of *Nous* in him.

Interpreting the *Prime Matter* of Paracelsus as the uncreated Logos we find ourselves at variance with two loci in the Paracelsian Corpus[22], albeit regarded as unauthentic, in which the view is expressed that God *created* the "Prima Materia Confusa" of the world, and also with the opinion given by a number of

[20] *Arcana* uncreated: *De Vera Influentia Rerum*, tract. I, ed. Sudhoff, vol. XIV, p. 215.

[21] *Dynameis* forming the luminous world, the ideal archetype of the sensible world: *Poimandres* 7 and 26. *Corpus Hermeticum*, ed. A. D. Nock and A.-J. Festugière, 2nd ed., Paris, 1960, vol. I, pp. 9 and 16; note 65 on p. 25 on "puissances qui constituent la lumière archétype". See also *ibidem*, note 68, on the "power" imparted by Poimandres—"cette dynamis peut impliquer des pouvoirs magiques qui permettent à l'âme de vaincre les archontes dans sa remontée vers l'Ogdoade". *Cf.* Hippolytus *Refutatio Omnium Haeresium*, VII, 32 (Carpocrates), ed. L. Duncker et F. G. Schneidewin, Gottingae, 1859, p. 402.

[22] *De Secretis Creationis*, Die Erste Würckung Gottes, Appendix to: *Chirurgische Bücher und Schrifften*, Strassburg, Zetzner, 1605, p. 106: "Die Fontein des Ursprungs der ewigen Weissheit . . . hat den obersten Thron des Himmels, die Engel in der ersten Materia durch sein ewig Wort geschaffen . . . aus der prima Materia . . . die Gott der Allmächtig aus nichts geschaffen hatte . . . "and: *Secretum Magicum de Lapide Philosophorum*, ed. Huser, Fol. Edit., vol. II, pp. 672–673 (as quoted by Pagel, *Ambix*, 1960, *loc. cit.*, in note 71, p. 146).

Paracelsians including Quercetanus (1544–1609), Khunrath (1560–1605) and—of the older generation—of Adam von Bodenstein (1528–1577) and Dorn (16th century second half)[23].

The question was perhaps dealt with more thoroughly by the unknown early English Paracelsian "R.B." than by anybody else. This author was identified with one Robert Bostocke as early as 1595, ten years after the appearance of his book: *"The difference betwene the auncient Phisicke, first taught by the godly forefathers, consisting in vnitie, peace and concord: and the latter Phisicke proceding from Idolaters, Ethnickes, and Heathen: as Gallen, and such other consisting in dualitie, discorde and contrarietie . . ."*. Some aspects of his book have been recently discussed, and its author called the only English writer in the 16th century who was more interested in Paracelsian theory than its practice[24].

For all these reasons a perusal of his book promises important information on the questions raised in the present paper. His twenty-first chapter is devoted to: *"Haw materia prima and misceria magna was the beginnying of all things according to Paracelsus his meanyng: and how all create were at one time in the increate"*

This is what Bostocke has to say: "One other great falt doeth Erastus finde with Paracelsus, for that he saiethe that prima materia and Misterium magnum was the beginnig of al thinges by separation. And this misterie he saieth to be increate hereof doeth Erastus conclude, that accordyng to Paracelsus creation, is nothyng but seperation. Though in this place and many other places of the same booke ad Athenienses he doth treate of the influences which proceed from God (as in the first entery of the same booke he plainly confesseth) and of in warde generations, and fruits, and of inward seperations (for deepe and secrete purpose) yet if Erastus had delte indifferently wyth hym, he myght easely perceive his meanyng in other of his workes, and also in this, where he findeth this horible herecie, concernyng the creation of vizible bodies to be according to Gods worde. For in his booke intituled Paramirum lib. I. cap. 2. he confesseth accordyng to Gods holy worde that Prima materia mundi was Fiat:

[23] Jos. Quercetanus, *Ad veritatem Hermeticae Medicinae*, Paris, 1604, p. 184; Heinrich Khunrath, *Vom hylealischen . . . natürlichen Chaos der naturgemaessen Alchymiae und Alchymisten*, Magdeburg, 1597, ed. used: Leipzig, 1786, pp. 20–21. Adam von Bodenstein, Epistola Commendatoria to Paracelsi *De Vita Longa* Basileae ap. P. Pernam (1562), sig. b6 *seq.* Ger. Dorneus, Physica Genesis in: *Clavis Totius Philosophiae Chimisticae. Theatrum Chemicum*, Argentor, 1613, vol. I, p. 368.

[24] A. G. Debus, *The Paracelsian Compromise in Elizabethan England, Ambix*, 1960, vol. 8, pp. 71–97 (pp. 77–84). The present author is indebted to Dr. Debus for having drawn his attention to Bostocke.

Aud in the same booke to the Athenians he saieth that Materia prima can not be perceiued by senses. Also in that booke Lib. I. cap. primo he plainely affirmeth that the vizible matter of ech thing was create, for thei were not with God at the beginning. For God created them of nothing, and inspired into them life and vertue"[25].

Bostocke defends Paracelsus against the accusations of impiety and Gnostic heresy made by Erastus some thirteen years before. These accusations had been mainly based on the *Philosophia ad Athenienses*. Against this Bostocke refers to other Paracelsian works in which creation of "each thing" had been given prominence and in particular to the passage from the *Opus Paramirum* in which the *Prima Materia Mundi* had been said to be the *Fiat* of God—the passage which we have discussed at length in the present paper. Indeed, according to Bostocke, the Paracelsian God is in the first place a Creator and not merely the separator of a pre-existing "chaos", as Erastus had inferred. Bostocke even goes so far as to declare that the *Prima Materia* of the world "was made, confused and without forme, out of whych all thynges were made . . . for though all thynges were made of that prima materia, yet that was made of nothyng"[26]. In other words the prime matter of the world—the *Fiat*—is here interpreted as an act of creation and Bostocke goes on to say that it was called *Coelum et Terra*—not because it was made as such, but made so *potentia*, "as it were the seede of heaven and earth"[27]. With this Bostocke has recourse to St. Augustine, who, in the twelfth book of the *Confessions*, views the world as made by God from *informis materia* that was made of nothing. He also refers to an ancient chemist who had said of the *simple substance* or the elements which are the matter of nature that they were "created *with* divine *separation*" ("creata *cum* divina *separatione*")[28]. In Bostocke's view there is thus no contradiction between the *Philosophia ad Athenienses* and the other books in which Paracelsus asserts the creative act of God. For the former does treat of the divine influences that reach and govern creatures and are embodied in the *arcana* and *semina*—the powers and virtues that immediately emerge from God and hence are "increate because God is without beginnyng increate"[29].

[25] Bostocke, "*The Difference . . .*" (title as quoted in text above), cap. 21, London, 1585, sig. kl verso to k2 recto.

[26] *Prima materia* made of nothing—Bostocke, *loc. cit.*, cap. 22, sig. kVII verso.

[27] *Fiat*—creation—heaven and earth: Bostocke, *loc. cit., ibidem.*

[28] World made of nothing according to St. Augustine; divina separatio: Bostocke, *loc. cit., ibidem.*

[29] Power and virtue increate: Bostocke, *loc. cit.*, cap. 20. sig. I3 verso *et seq.*

They were in "God of heaven and earth, when the spirit of God was carried upon the waters[30], even so likewise when the heaven and earthe shall perishe, all vertues shall returne to God againe, because they had no beginning". These are the true divine influences which St. Augustine distinguished from those which come to us from heaven or spirits. Indeed, according to Bostocke, it was Paracelsus' opinion that these divine virtues were originally united in God, but "after that by the vertue of the spirite, whiche was caryed upon the waters, they were commanded to doe their offices in the worldly ministration, they were seperated and diuided in offices, life, essenties and beyings". There is therefore no need to let these proceed from a *chaos*, but as treasures of divine wisdom they should be visualized as latent in individual objects, divided and separated in "just and true order, proportion, forme, figure and qualitie" in order to bring the individual to maturation and perfection at the appointed time. Yet there is no idea that the objects of nature are consequently the component parts of divinity in a pantheist sense. It is rather a pan-entheist view that is taken by Bostocke: "as the beames of the Sunne be in those whereupon it shineth, yet the substance of the Sunne is not in them, neither is God in part any where but in singulis totus and in omnibus omnis. . . . The true meanyng of Paracelsus herein is that euery creature maie justly bee saide to be in God, because without God there is nothyng: but yet they be not so in God, that they be of his substance, or parte of hym: For it followeth not, that the thyng that is in an other, is that thyng in which it is. For wine is in the bottle, yet the wine is not the botle . . .". Here again Bostocke invokes St. Augustine who taught "by expresse wordes, that euery creature is in the creator, and God is in euery creature"[31].

Bostocke would thus appear to favour the idea that *Prime Matter* was created and to side with the two passages from *De Secretis Creationis* and the *Secretum Magicum* respectively which we mentioned above and with Quercetanus and Khunrath. Bostocke speaks about Being ("On") and "Logos" as the kernel of *Life* which is immortal and immanent to all objects of nature[32], but does not interpret the prime matter of the world in terms of the uncreated Logos that was *with God* in the sense of the Fourth Gospel. He does say, however, that Paracelsus attributed the beginning of things to prime matter which is *fiat* ("which I judge to be the divine will") as well as to "the first councell of the spiritual motion, as to Misterium magnum, which he meaneth

[30] Arcana in God: Bostocke, *loc. cit., ibidem* with ref. to Paracelsus' *De Vera influentia Rerum*, tract. I, ed. Sudhoff, vol. XIV, p. 215.

[31] Panentheistic view: Bostocke, *loc. cit.*, cap. 21, sig. kV verso to kVI.

[32] Being and *Logos*: Bostocke, *loc. cit.*, cap. 20, sig. kI recto.

to be Christ . . ."[33]. He then argues on both lines: (*a*) the origin of all things is in prime matter which is the—created—*Fiat* and (*b*) it is also in Christ that is to say God's wisdom, word and virtue. "In this sorte Christ that great mistery was the beginnying of all thynges"[34]. This is the *Mysterium magnum* from which not the things themselves (as Erastus erroneously maintains), but each individual "mystery" namely each arcanum or virtue emerged. Bostocke also emphasizes the presence everywhere in natural objects of these uncreated *arcana* and virtues, although he militates against their interpretation in a pantheist sense.

*Taken as a whole* Bostocke's views support the interpretation of *Prime Matter* and the *Mysterium Magnum* as the uncreated divine spirit which assumes a position comparable to the *Logos* of the Fourth Gospel which was *with God* and became *flesh*. Bostocke's plea that Paracelsus' view was that of Pan-entheism and not of Pantheism is debatable. The Paracelsian *Arcana* are immediate divine powers and virtues and as such the only part in objects of nature which have a claim to be real and essential. On the other hand Paracelsus did insist that the *arcana qua* divine are not "natural", for "how can God be natural?" Moreover Paracelsus says that all "virtues and powers were *in* God before heaven and earth"[35]—a passage which may be adduced in support of Bostocke's pan-entheist view. We will certainly agree with Bostocke, however, that the ideological source for the *Semina* of Paracelsus is St. Augustine, although we have no direct evidence that Paracelsus was acquainted with the latter's works in detail[36].

## IV

### Epilogue: Paracelsian Prime Matter and Gnostic Speculation

To *sum up*: The *Prime Matter* of Paracelsus is not matter in the usual sense, but the ideal pattern and spiritual prelude to the material world. It thus approximates to the *Logos* of the Fourth Gospel. Like this it is *uncreated*, as it is a direct emanation from divinity. It is said to be *with God* and just as the *word* becomes *flesh*, so *prime matter* is converted into the *visible and material world*.

[33] Paracelsian *prima materia mundi* was *Fiat*: Bostocke, *loc. cit.*, cap. 21, sig. kII recto.

[34] Christ the beginning of all things: Bostocke, *loc. cit.*, cap. 21, sig. kV recto.

[35] *De Vera Influentia Rerum*, tract. I, ed. Sudhoff, vol. XIV, p. 215.

[36] Paracelsus and St. Augustine: see Pagel, *loc. cit.*, *Ambix*, 1960 (notes 136–140), pp. 162–163. On the *Semina* in the doctrine of Paracelsus: Pagel, *ibid.*, 1960, p. 136.

This *prime matter of the world* must be distinguished from the *prime matter of individual objects*, the *semina*, which are *created from nothing*. From these the objects step out at appointed times and become *ultimate matter* in the form of fully developed individuals. This *ultimate matter of individual objects* must again be distinguished from the *ultimate matter of the world*—a designation of the *prime matter of the world*, occasionally introduced by Paracelsus in order to avoid confusion with the *prime matter of individual objects*.

The Paracelsian prime matter of the world shares with St. John's *Logos* a specific Hermetic, Gnostic, Hellenistic and Rabbinical background[37]. It is unlikely that Paracelsus was aware of this in any detail—however much other Paracelsian doctrines were affiliated to Hellenistic philosophy, Gnosticism and Hermeticism.

At first sight, indeed, Paracelsus' concept of *Prime Matter* does not seem to be informed by what is generally regarded as the basic idea of Gnosticism—the polarity and contrast between divine spirit on the one hand and the dark abyss of matter uncreated and co-existing with God on the other. For, as we have seen, Paracelsian *Prime Matter* is divine spirit and not matter in the usual sense. However, Gnosticism was fundamentally concerned with the origin of the world as the embodiment of evil and the latter was not necessarily conceived as a principle *outside* and separate from God, nor as something substantial. It was indeed meant as a pure principle and as such could be visualized as a part of divinity itself. This *negative principle intrinsic in divinity* would act as a factor limiting and determining God's infinite perfection and indeterminateness, and would do so as soon as God manifested Himself through activity and creation[38]. Even so, however, the contrast between spirit and matter remains the same, although it indicates a rift within divinity rather than two opponents meeting each other. Instead the antagonist arises in God as an inexplicable urge to step out and manifest Himself in a world in which the

[37] See C. H. Dodd, *Interpretation of the Fourth Gospel, loc. cit.*, Cambridge, 1953, Hermetic Literature, pp. 10 *et seq.*; Hellenistic Judaism: Philo of Alexandria, p. 54 *et seq.*; Rabbinic Judaism, pp. 74 *et seq.*; Gnosticism, pp. 97 *et seq.*; Mandaism, pp. 115 *et seq.*

[38] Ferd. Chr. Baur, *Die Christliche Gnosis oder die Christliche Religions-Philosophie in ihrer geschichtlichen Entwicklung*, Tübingen, 1835, p. 23: "Die Materie kann zwar in einem verschiedenen Verhältnis zu Gott stehen, sie wird entweder ausser Gott als ein ihm gleich ewiges Prinzip gedacht, oder in das göttliche Wesen selbst gesetzt, oder sie ist nichts wirklich Substanzielles, sondern nur das Prinzip des Negativen, das sobald die Gottheit sich offenbart, und der Gegensaz des Unendlichen und Endlichen entsteht, von der endlichen Welt, in welcher die Gottheit sich offenbart, als das die Vollkommenheit des göttlichen Wesens beschränkende und begrenzende nicht getrennt werden kann . . .".

perfection of divinity can only exist in a limited and finite form[39]. This internal urge by which God appears bound, as it were, could only be imposed upon Him by matter—the negative principle in Him that denies the absoluteness of divinity. Eventually this principle is subject to negation in its turn and is overcome by redemption—the return of the finite to God. Spirit—absorbed and captured by matter—must be liberated, whereby divine manifestation returns to its point of departure and becomes conscious of its absolute power, i.e. its independence of matter. This sequence of events is indeed basic to all Gnostic systems—however much they vary in detail[40].

The concept of the immanence of matter in God appears to be basically in line with *Hermetic* doctrine. In this the omnipresence of God is emphasized first and foremost.

"There is not anything of all that hath been, and all that is, where God is not." Hence: "The matter, son, what is it without God, that thou shouldst ascribe a proper place to it?" There is no matter that is not made active (*energeitai*—"actuated")—"but if it be actuated, by whom is it actuated" other than by God . . . "for we have said, that Acts or Operations are the parts of God . . . whether thou speak of Matter, or Body, or Essence, know that all these are acts of God. And that the Act of Matter is materiality and of the Bodies corporality and of Essence essentiality; and this is God the whole. And in the whole there is nothing that is not God"[41]. It was God who produced matter (*Hyle*) by separating materiality (*Hylotes*) from essentiality said Jamblichus[42]. Indeed, the formation of the universe is visualized by Hermes

[39] Baur, *ibidem*, p. 23: "Aber auch selbst in diesem Falle, wenn der Begriff der Materie nur auf dieses Minimum reducirt ist, bleibt der Gegensaz zwischen Geist und Materie an sich völlig derselbe . . . so bleibt, wenn auch die Materie nicht als selbständiges Prinzip Gott gegenübersteht, in Gott doch immer der nicht weiter erklärbare Hang, aus sich herauszugehen, und sich in einer Welt zu offenbaren, in welcher die Vollkommenheit des göttlichen Wesens sich nur als eine beschränkte und endliche darstellen kann".

[40] Baur, *loc. cit.*, p. 24: "Dies sind die Hauptmomente der Selbstoffenbarung des göttlichen Wesens und der Weltentwiklung, durch welche sich alle gnostische Systeme bei aller ihrer Variation hindurchbewegen". See also on a monistic view overcoming oriental dualism in the Valentinian Gnosis: W. Bousset, *Hauptprobleme der Gnosis*, Göttingen, 1907, pp. 106 *et seq.* Already in the system of Basilides dualism had been superseded by the monistic perspective of divine emanations.

[41] *The Divine Pymander of Hermes Mercurius Trismegistus*, transl. by that Learned Divine Doctor Everard, London, 1650, p. 156 (XIth Book, 117–125). *Corpus Hermeticum*, ed. A. D. Nock and A.-J. Festugière, Paris, 1960, tract. XII, 21–22, pp. 182–183, and note 71 on p. 191 on *Hylotes*. In 22 the passage given above is translated: "Suppose, mon enfant, que la matière existe séparée de Dieu, quel lieu vas-tu lui assigner pour sa part?"

[42] Jamblichus, *De Mysteriis Liber*, ed. G. Parthey, 1857, VIII, 3, p. 265.5.

as a process that takes place *in* God[43]. "I am that Light, the Minde, thy God, who am before that moyst Nature that appeared out of darkness." When "one of an exceeding great stature and an infinite greatness" manifested Himself to Hermes in a vision he first saw all light, and only "after a little while, there was a darkness made in part, coming down obliquely, fearful and hideous which seemed unto me to be changed into a certain moyst nature, unspeakably troubled, which yielded a smoke as from fire . . ."[44].

On the other hand the Hermetic Corpus extols the glory of God through creation. There is no loss of status connected with it. "And let no man be afraid, because of the variety of things that are made or done, lest he should cast an aspersion of baseness, or infamy upon God; for it is the onely Glory of him to do, or make All things." Nor is there anything evil about the creator—for evil things "are Passions that follow Generation, as Rust doth Copper, or as Excrements do the Body. But neither did the Coppersmith make the Rust, nor the Maker the Filth, nor God the Evilness"[45].

Here then a stand is taken against certain Gnostic doctrines in which the very fact of creation depreciates God's majesty and a distinction is made between the good God-Father and the Creator-God[46]. The optimistic—antignostic—attitude of the *Hermetic Corpus* is not unknown to Paracelsus who extols Creation as the *Magnale* through which we obtain knowledge of God. The Hermetic *Asclepius* tells us that the world exists for man, as man exists for God. Man created as microcosm is called upon to govern the world, following and imitating the pattern of divine government (*Asclepius*, cap. 8–10). Paracelsus' view of the world is "anthropocentric" and may conceivably have been modelled on such Hermetic ideas. Indeed, according to Paracelsus, the creation was good and beneficial in the beginning, but—harbouring the germs of good and evil—it deteriorated owing to the fall of some of the angels. "In the world the beginning of all things was good and pleasing to God, but time has broken the good and it was split into good and evil—from good came evil in the world as well as in heaven . . . thus first the

[43] *Corp. Hermeticum, loc. cit.*, tract. I, *Poimandres*, Introduction: "Formation du monde dans le premier Nous (Père) 4–8".

[44] *Pymander*, transl. Everard, 1650, *loc. cit.*, *Second Book called Poemander*, 1–5, pp. 13–15, and *Corp. Hermet.*, *loc. cit.*, tract. I, *Poimandres*, 1–4, vol. I, pp. 7–8.

[45] *Corpus Hermeticum*, tract. XIV, 7, ed. Nock and Festugière, *loc. cit.*, vol. II, p. 224. Transl. by Everard, *loc. cit.*, 1650, pp. 212–213.

[46] Festugière in *Corp. Hermet.*, vol. II, p. 227, note 18 to tract. XIV, also with ref. to *Asclepios* 15–16, *ibid.*, p. 314, and note 135 on pp. 371–372 on the evil of world and earth.

angels were made miraculously beautiful and good, but some of them sinned and . . . were ejected from the realm of God." (Paracelsus, *Philosophia Sagax*, lib. IV, cap. 1, ed. Sudhoff, vol. XII, p. 417.)

Perhaps it is permissible to compare the Gnostic idea of the negative principle connected with creation with *Kabbalistic* speculation on the supreme Being, the Infinite (*En-Soph*). This is visualized as absolute negation and called *Nothing* (*Ayin*), as it is entirely inaccessible to human understanding and defies definition. More particularly in Kabbalistic tradition it was through an impulse towards creation that God undid the secret inaccessibility of His abstract Being and this impulse is called *Nothing*. It is not the stepping-out of God into activity and creation, but the urge leading to it that is so called and also designated as *I shall be* (*Ehje*). *In* this absolute Nothing creation *from* Nothing unfolds itself, and the Nothing is in some places called aboriginal *Will*[47].

Comparing this with the idea of matter intrinsic to divinity, its designation as Nothing would denote its limitation and descent into the finiteness of matter and the world. Acting as the first cause of *all* that is existent, it would have to be non-existent in itself. Its conversion from incomprehensible spirit into something that is comprehensible, i.e. into matter, would stand for the creation of *something* from *Nothing*.

It is of particular interest that in this Kabbalistic speculation the *Word* emerges with its creative power. The divine Nothing is also seen as the archetypal *light* that forms an *Aura* around the supreme Being in His original state of infinite remoteness and withdrawal. *Qua* first *cause*, this light manifests itself through its *Wisdom* and *Word* as the prototype of the whole creation or macrocosm (*First Adam—Adam Kadmon*)[48]. The infinite Nothing could not manifest itself directly, but needed a mediating instrument—the *sefirot*, i.e. the sum total of creative powers and potentials. One of these is the *Word* for the

[47] G. Scholem, *Die Geheimnisse der Schöpfung. Ein Kapitel aus dem Sohar*, Berlin, 1935, pp. 31–32: "Die erste Sefira, der innerste aller Aspekte, in dem die ewig undurchdringliche Wendung des Schöpfers zur Schöpfung bezeichnet wird, ist der Name *Ehje* 'ich werde sein'. Dies Hervortreten aus dem Ungrund, das noch gar kein 'Hervor'treten ist, sondern nur der Ruck, in dem er die Verschlossenheit seines 'An sich' vernichtet, heisst . . . das *Nichts*. . . . In diesem . . . 'absolut' genannten Nichts, vollzieht sich die wahre 'Schöpfung aus dem Nichts'. . . . An anderen Soharstellen heisst dies Nichts der Urwille". See also: G. Scholem, *Die mystische Gestalt der Gottheit in der Kabbala*, Eranos Jahrbuch, Vol. 29, Zürich, 1961, p. 165.

[48] S. Munk, *Mélanges de Philosophie Juive et Arabe*, Paris, 1859, p. 492, and S. Munk, *Philosophie und philosophische Schriftsteller der Juden mit Anmerkungen* von B. Beer, Leipzig, 1852, p. 53.

"world of the 'sefirot', the total of divine expression—a world aptly called 'internal face'—is conceived as a secret archetypal world of language"[49].

The conceptual elements, then, that are essential to Paracelsian *Prime Matter* can be found in Gnostic as well as Hermetic and Kabbalistic speculation: matter as a part of divinity, forming a hypostasis that subsists *with* God, acts as the Wisdom and *Word* that creates from *Nothing* and becomes ordinary matter (*Flesh*) which calls for liberation and redemption by eventually returning to the supreme Being.

Paracelsian *Prime Matter* in its role as the spiritual pattern of the material world, and the pantheistic version of this idea given by Paracelsus in certain places, compare with the *Prime Matter* of Solomon ibn Gabirol (Avicebron, 1020–1070)—an immediate emanation from the Creator which follows Him in the hierarchy of steps constituting the world both in its real existence and its contemplation by the mind. This *matter* precedes *form*—for it is simple and infinite and it is through form that limitations, diversity, specification and finiteness are imposed upon it. It is well known how this philosophy influenced David of Dinant (d. 1209) and mediaeval Pantheism[50].

Closeness to Gnosticism impresses itself readily in some Paracelsian ideas connected with the concept of *Matter*: first and foremost is that of the creation of the elements in connexion with the Fall and punishment of Lucifer[51].

[49] G. Scholem, *loc. cit.*, 1935, p. 29: "Die Welt der Sefirot . . . wird als eine geheime Urwelt der Sprache aufgefasst . . . Vorstellung vom Wort als Kraft . . .".

[50] See on this point: Pagel, *Paracelsus, loc. cit.*, 1958, pp. 227–236. B. Sart. von Waltershausen, *Paracelsus am Eingang der Deutschen Bildungsgeschichte*, Leipzig, 1936, pp. 128–129, quotes a passage from Valentin Weigel, *Theologia Weigelii*, Newstadt, 1618, cap. 6, fol. 17. In this Weigel claims that David de Dinando, Theophrastus (Paracelsus) and himself agree in saying that God, *materia prima* and heaven are eternal and that God is all this Himself. According to Waltershausen there is but little connexion with mediaeval thinking in either Paracelsus' or Weigel's works and it is characteristic that the latter alludes to a mediaeval pantheist who stands outside the scholastic tradition.

For mediaeval Judaeo-Arabic sources according to which *prime matter* "represents the lowest grade of the spiritual substances, and stands at the gateway, as it were, of the sensible world . . . that prime matter itself is a simple spiritual substance which emanates from the soul and which cannot be perceived by the senses" see A. Altmann and S. M. Stern, *Isaac Israeli. A neo-Platonic Philosopher of the early Tenth Century*, Oxford, 1958, p. 182.

[51] *Prolog, Konzepte und Ausarbeitungen zum Liber Meteororum*, ed. Sudhoff, vol. XIII, pp. 253–254. The *suggested emergence of this view* in the *Jewish religious philosophy of the Middle Ages* is of some interest and may be here noted in passing. Allegedly, according to Gersonides, hell—*sheol*—is the *Hyle-ha-rischon*, the first matter and origin of evil (ad Proverb. XV, 11, and XXVII, 20—quoted from J. C. Wolf, *Manichaeismus ante Manichaeos et in Christianismo redivivus*, Hamburg, 1707, pp. 44–45). Wolf adducing

Among further Paracelsian views that are palpably influenced by Gnosticism, we refer to his recognition of water as a general *matrix* and receptacle for *semina* and to the concept of *cagastrum*—the falsehood inherent in the ever-changing phenomenal world. In ancient tradition this had been aptly symbolized by the dragon which insatiably devours its own tail, standing for darkness and evil[52]. We also refer to the Paracelsian *astral body*, and to his ideas on the passions of the soul and its animal instincts that lead to insanity. Our discussion of this and related doctrines in the light of the Hermetic tradition can be found elsewhere[53] and should be compared with the Paracelsian philosophy of *Prime Matter*—another Platonic-Christian doctrine which forms the subject of the present paper.

[52] See for example Festugière's note 9, p. 12, to *Poimandres* 4 in *Corpus Hermeticum*, ed. A. D. Nock and A.-J. Festugière, 2nd ed., Paris, 1960, vol. I, on Serpent and Darkness with references to Gnostic sources including the *Ouroboros* as represented for example by W. Bousset, *Hauptprobleme der Gnosis*, Göttingen, 1907, pp. 100–101.

[53] The present author in *Ambix*, 1960, vol. VIII, pp. 125–166.

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[51] *continued.*

further literature remarks to this: "Atque hic quidem error de materia mali origine non existimandus est semper Judaeorum inhaesisse animis, sed Philosophorum gentilium debetur lacunis, quas Judaeorum Philosophi sequiores cum S. scripturae canalibus commutarunt". Indeed Jewish philosophy is consonant with the *Placita Platonicorum*, as Maimonides asserted, whom one should follow—rather "quam cum Helmontio in praefat. ad *Alphabetum Natur.* temere negare, Ebraeorum Philosophiam Platonicis dogmatibus plenam esse".

# THE LEGEND OF BERNARD PALISSY

By Wallace Kirsop*

Of Renaissance scientific writers and craftsmen still relatively familiar to modern readers, Bernard Palissy is among the most admired. The reasons for this continued esteem are set out succinctly, and not without sobriety, in *The Oxford Companion to French Literature*. The potter's "scientific and inquiring spirit", his "strong and elevated character", which enabled him to suffer years of poverty and hardship while he was experimenting to find effective glazes or enamels, his "love of nature", these are the qualities that recommend him to posterity[1]. Nineteenth-century biographers[2] are less restrained in their adulation of the tireless seeker after truth, the devoted artisan, the Huguenot martyr and the brilliant precursor of modern science. One imagines from a remark of the character Strouvilhou in André Gide's *Les Faux-monnayeurs*[3] that Palissy was often held up to young Protestants in nineteenth-century France as an example of moral excellence and of the virtues of selfless toil. But the tradition of the potter's contribution to chemistry and geology, to the definition of modern scientific method, is no less insistent. Historians little concerned with Palissy as a hero à la Samuel Smiles emphasize what they claim to be the novelty of his ideas or the modernity of his approach to scientific research and teaching[4]. Allbutt even calls him "one of the chief engineers of the new paths of knowledge"[5]. Thus the "popular legend"[6] of Palissy's arduous road to success as a potter is coupled with the most ambitious claims for his powers of observation and his clear recognition of the value of experiment as opposed to the authority of the Ancients.

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[1] *The Oxford Companion to French Literature*, compiled and edited by Sir Paul Harvey and J. E. Heseltine, Clarendon Press, 1959, p. 534.

[2] *Cf.* Henry Morley, *Palissy the Potter. The Life of Bernard Palissy, of Saintes*, London, Chapman and Hall, 1852, 2 vol., and E. Martelet, *Bernard Palissy*, Paris, Hachette, 1868.

[3] André Gide, *Romans. Récits et soties. Œuvres lyriques*, Paris, N.R.F., 1958, p. 1197.

[4] *Cf.* Ernst von Meyer, *A History of Chemistry from earliest times to the present day* (tr. G. McGowan), London, Macmillan, 1891, pp. 82–3; and J. M. Stillman, *The Story of Alchemy and Early Chemistry*, New York, Dover Publications, 1960, pp. 346–9.

[5] Sir Thomas Clifford Allbutt, *Palissy, Bacon, and the Revival of Natural Science* in *Proceedings of the British Academy* 1913–1914, p. 247.

[6] *Cf.* Benjamin Farrington, *Francis Bacon Philosopher of Industrial Science*, London, Lawrence & Wishart, 1951, p. 13.

The image of Palissy, laborious creator of the experimental method, is based chiefly on the *Discours admirables*[7], first published in 1580, and in particular on the section of that work entitled *De l'Art de terre, de son utilité, des esmaux et du feu*[8]. It is here that the potter recounts in detail his trials and tribulations as he sought to master the secret of white enamel. Small wonder, then, that this text is the one most often reproduced[9] or chosen for inclusion in anthologies[10]. In combination with the highlights of Palissy's apparent geological and chemical prescience, it can only confirm the layman in his admiration for this early champion of empiricism.

Since the history of science has become an established discipline, Palissy's reputation has suffered somewhat, and the former uncritical panegyrics have given way to sceptical reappraisals. Duhem[11], Lucien Febvre[12], Professor Thorndike[13] and M. Bachelard[14], amongst others, have shown how the *Discours admirables* take over ideas from Leonardo da Vinci, via Cardan, repeat common mistakes of the time, and, in general, are limited by the scientific and philosophical attitudes one would expect from a sixteenth century artisan or craftsman. The originality, modernity and uniqueness of Palissy's position are seen to be considerably exaggerated. For an untutored potter, ignorant of Latin, Palissy has managed to read widely enough; for a devotee of experience and

[7] *Discours admirables, de la nature des eaux et fonteines, tant naturelles qu'artificielles, des metaux, des sels & salines, des pierres, des terres, du feu & des émaux. Avec plusieurs autres excellens secrets des choses naturelles. Plus un traité de la marne, fort utile et necessaire pour ceux qui se mellent de l'agriculture. Le tout dressé par dialogues, esquels sont introduits la theorique & la practique*, Paris, Martin le Jeune, 1580, in – 8°. This and other texts of Palissy are quoted from *Les Œuvres de Bernard Palissy publiées d'après les textes originaux, avec une notice historique et bibliographique et une table analytique par Anatole France*, Paris, Charavay frères, 1880, in –16. For an English translation, see the *Admirable Discourses of Bernard Palissy* (tr. Aurèle La Rocque), Univ. of Illinois Press, Urbana, 1957.

[8] *Les Œuvres . . .*, pp. 372 *sqq*.

[9] E.g. Philippe Burty reprints long extracts (*Bernard Palissy*, Paris, J. Rouam, n.d., pp. 29 *sqq*.).

[10] *Cf.* Joseph Vianey, *Les Prosateurs du XVI^e siècle*, Paris, Hatier, 1948, pp. 332–338.

[11] In *Etudes sur Léonard de Vinci: ceux qu'il a lus et ceux qui l'ont lu*, Paris, Hermann, 1906. *Cf.* H. R. Thompson, *The Geographical and Geological Observations of Bernard Palissy the Potter* in *Annals of Science*, vol. 10, 1954, pp. 162–3.

[12] *Cf.* Lucien Febvre, *Le Problème de l'incroyance au XVI^e siècle*, Paris, Albin Michel, 1947, pp. 446–447.

[13] *A History of Magic and Experimental Science*, vol. V, pp. 441–2, 596–99.

[14] *Cf.* Gaston Bachelard, *La Formation de l'esprit scientifique*, Paris, Vrin, 1957, p. 121.

observation he has contrived to make a respectable number of assertions that smack of animism[15]. His scientific preeminence and priority, then, are doubtful, to say the least.

Criticism of Palissy's autobiography has been much milder. Sauzay and Henri Delange, disinclined to accept the potter's own description of his humble station in life as entirely accurate, seem largely concerned to prove that his country did not fail to recognize and reward his talents. Faced with the paucity of archival material concerning Palissy, they do not pursue to its extremity the contradiction between the artist's alleged poverty and his not inconsiderable, albeit Latinless, culture[16]. Burty and Morçay express surprise that one trained in glass-painting should have such great difficulty acquiring techniques of glazing already known in Italy[17]. Yet nowhere do historians appear to doubt the substantial accuracy of an account for which we have no evidence but Palissy's own word.

Should the potter's moral heroism remain unimpeached while his contributions to science are reduced to their right proportions? The uneasiness expressed by some biographers, even where Palissy's story of his own life is concerned, is an invitation to look again at the *Discours admirables*. If this critical re-examination is mindful of the attention given to alchemy in this work, as indeed in the *Recepte véritable*[18] of 1563, it may be possible to shed fresh light on Palissy's aims, intellectual methods and literary techniques. In other words, if the *Discours admirables* are situated in the context of sixteenth century alchemical literature, their true character (which is certainly not alchemical) may nonetheless become more apparent.

Though the fiction of a dialogue between Théorique and Practique is kept up all through the *Discours admirables*, it is important to see that the work is in fact a series of tenuously connected treatises on subjects of interest to Palissy.

[15] See in particular Thorndike, *op.cit.*, vol. V, p. 599.

[16] *Cf. Monographie de l'oeuvre de Bernard Palissy suivie d'un choix de ses continuateurs ou imitateurs dessinée par MM. Carle Delange et C. Borneman et accompagnée d'un texte par M. Sauzay et M. Henri Delange*, Paris, 1862, in-folio, pp. 7, 10–11.

[17] See Burty, *op. cit.*, pp. 29–30, and Raoul Morçay, *La Renaissance*, vol. II, (t. III of *Histoire de la littérature française* publiée sous la direction de J. Calvet), Paris, J. de Gigord, 1935, p. 144.

[18] *Recepte veritable, par laquelle tous les hommes de la France pourront apprendre a multiplier et augmenter leurs thresors. Item, ceux qui n'ont jamais eu cognoissance des lettres, pourront apprendre une Philosophie necessaire à tous les habitans de la terre . . .*, La Rochelle, Barthélemy Berton, 1563 (and 1564, *cf.* E. Droz, *Barthélemy Berton* (1563–1573), Geneva, Droz, 1960, p. 27), in $-4^{o}$. *Cf. Les Œuvres . . .*, pp. 7–158.

Thus the section *De l'Art de terre*[19], prepared in some measure by the preceding one, *Des Terres d'argile*[20], is quite separate in intention and in technique. One might suppose that it was merely an excuse for the long speech of Practique that has always been taken for the author's own sincere account of his sufferings while perfecting his art[21]. However, such an interpretation does violence to the quite careful composition of a text whose purpose is far removed from that of nineteenth-century sentimental outpourings.

It will be noticed first of all that throughout the section Théorique is no longer in character. This is not the amiable but rather dull person, crammed with the book-learning Palissy affects to despise, with whom Practique argues about alchemy, or *aurum potabile*, or the formation of stones. Here Théorique is entirely submissive, a willing disciple, a would-be initiate. For nothing less than initiation is adequate for him that would learn the secrets of the potter's art. The secret must be kept, Practique is quite adamant about this. It is useless for Théorique to claim instruction in this craft by reaffirming the principle[22] Palissy puts forward in his dedicatory epistle to Antoine de Ponts[23]. This is a case where a man has the right to hide the talent God has given him. Economic security is more important than the free transmission of scientific truth, that rule of intellectual probity that Palissy was seemingly one of the first to formulate[24]. When Théorique has agreed, after hearing the list of crafts ruined by the indiscriminate dissemination of trade secrets[25], to keep what he is taught to himself, Practique can assume the paternal role of the initiator: "Je voudrois faire beaucoup pour toy, et te voudrois avancer d'aussi bon coeur que mon propre enfant:"[26] The relationship thus entered into is not broken off until near the end of the section, when Théorique, annoyed at Practique's refusal to reveal anything concrete or useful, adopts what amounts to an attitude of sour grapes[27]. The dialogue then ends with a long declaration by Practique of the qualities of the potter's art. However, up to that point, the parts played by the protagonists are quite consistent with those of an alchemical treatise in dialogue form.

[19] *Les Œuvres . . .*, pp. 372–394.
[20] *Ibid.*, pp. 363–372.
[21] *Ibid.*, pp. 378–390.
[22] *Ibid.*, p. 373.
[23] *Ibid.*, p. 163.
[24] *Cf.* L. Febvre, *op. cit.*, pp. 451–2.
[25] *Les Œuvres . . .*, pp. 373–5.
[26] *Ibid.*, p. 376.
[27] *Ibid.*, p. 392.

Here is the most striking feature of this section and the key to understanding it. Palissy, aware of the analogy between the necessarily secret arts of pottery and alchemy, since he has already outlined in an earlier section the dangers of a general divulgation of the recipe for the Philosophers' stone[28] (to which, nevertheless, he refuses any reality), transfers to his own craft the literary artifices of the alchemists. A generation later, Béroalde de Verville, long an enthusiastic student of alchemical literature, was to adapt the form of the *Turba Philosophorum* in *Le Moyen de parvenir*[29]. In neither case is it legitimate to conclude that the resultant works carry an alchemical message. Palissy's purpose can only be determined after a study of the details of his adaptation of alchemical themes and tricks of style. And it is in the light of this that the significance of the supposedly autobiographical passage must be assessed.

That the vehicle chosen for this revelation, (Théorique expressly uses the word *révéler*[30]) made by venerable master to callow student, should be a dialogue is in keeping with alchemical tradition. One need only recall the dialogues in Sendivogius's *Novum Lumen Chymicum* and *Tractatus de Sulphure*[31] or a text sometimes attributed to Basil Valentine, *Azoth, ou le moyen de faire l'or caché des Philosophes*[32]. Admittedly, these works appeared later than Palissy's, but the convention goes back to the earliest Hermetic literature[33]. For that reason it provides an appropriate framework for the potter's essay in initiation.

Having accepted the responsibility of enlightening Théorique, Practique is quick to warn him of the moral qualities he needs to face the trials ahead as well as of the considerable expense he will certainly incur[34]. The alchemists, of course, are unanimous in denying their art to those that are morally unworthy of it, as treatises of all periods attest[35]. Théorique refuses to be daunted,

[28] *Les Œuvres* . . ., pp. 263–4.

[29] As is pointed out by M. V.-L. Saulnier (*Etude sur Béroalde de Verville. Introduction à la lecture du "Moyen de parvenir"* in *Bibliothèque d'Humanisme et Renaissance*, t.V, 1944, pp. 294–5).

[30] *Les Œuvres* . . ., p. 376.

[31] See the first English translation *A New Light of Alchymie : Taken out of the fountaine of Nature, and Manuall Experience. To which is added a Treatise of Sulphur*: . . ., London, printed by Richard Cotes for Thomas Williams, 1650, in –4°, f. $I_2^r$: *A Dialogue between Mercury, the Alchymist and Nature*, and f. $R3^v$: *Of Sulphur*.

[32] With *Les Douze clefs de Philosophie de Frere Basile Valentin* . . ., Paris, J. &. C. Périer, 1624, in –8°. This dialogue of Adolphus and Senior first appeared in *Azoth,sive Aureliae Occultæ Philosophorum* . . ., Frankfurt, Johann Bringer, 1613, in –4°.

[33] *Cf.* A.-J. Festugière, *La Révélation d'Hermès Trismégiste I : L'Astrologie et les sciences occultes*, Paris, Gabalda, 1944, ch. IX, pp. 309 *sqq*.

[34] *Les Œuvres* . . ., p. 376.

however. Will he not profit by Practique's experiences? The latter has promised to set it all down in writing for him. But Practique repeats his warning:

> "Quand j'aurois employé mille rames de papier pour t'escrire tous les accidens qui me sont survenuz en cherchant ledit art, tu te dois asseurer que, quelque bon esprit que tu ayes, il t'adviendra encores un millier de fautes, lesquelles ne se peuvent apprendre par lettres, et quand tu les aurois mesme par escrit, tu n'en croiras rien jusques à ce que la pratique t'en aye donné un millier d'afflictions"[36].

There is no avoiding the long and difficult search for practical success, however abundantly the novice may be provided with textbooks. The lesson is again one that alchemical writers are fond of repeating, although it is unusual to see them so doubtful of the efficacy of the written word[37]. Their confidence in the authority of the masters is certainly shared by Théorique, whose unshakeable optimism induces Practique to embark on a detailed description of his experiments.

In all that thus prepares the central passage of *De l'Art de terre* it is still possible to see little more than fortuitous analogies with alchemical literature, in so far as Palissy's treatment of the themes is quite free, the reverse of slavish imitation or laboured parody. Almost paradoxically, it is the celebrated narrative itself that betrays most clearly the source of the potter's inspiration. Quite a number of the incidents or accidents so touchingly evoked fall within the scope of a minor literary genre, or rather complex of themes, that could be called the alchemical biography. Curiously enough, such biographies enjoyed a particular vogue in the latter part of Palissy's lifetime.

The long years of effort, of trial and error, that Practique remembers, have a parallel in the careers of Denis Zacaire and Bernard of Treves, made known to French readers as early as 1567 in *Opuscule treseccellent, de la vraye philosophie naturelle des metaulx, traictant de l'augmentation & parfection d'iceulx,*

[35] *Cf. Les trois livres de la Chrysopee, c'est à dire L'art de faire l'Or, contenants plusieurs choses naturelles, traduicts de Jean Aurelle Augurel poete latin par F. Habert de Berry*, Paris, J. Longis, 1550, in –8°, f. 26 r-v, and Thomas Norton, *The Ordinall of Alchemy* (facsimile reproduction from E. Ashmole's *Theatrum Chemicum Britannicum*), introd. by E. J. Holmyard, London, Arnold, 1928, pp. 13–14.

[36] *Les Œuvres . . .*, pp. 377–8.

[37] See *inter alia* John French's *Epistle to the Reader* in *A New Light of Alchymie . . .*, 1650, f. A4 r-v, and *Le Livre des secretz d'alquimie compose par Calid . . .* in *Le Miroir d'alquimie de Rogier Bacon philosophe tres-excellent . . .*, Lyons, Macé Bonhomme, 1557, in –16, 1st part, pp. 57–61.

*Avec advertissement d'eviter les folles despences qui se font ordinairement par faulte de vraye science: par Maistre D. Zecaire, Gentilhomme & Philosophe Guiennois. Avec le traicté de venerable Docteur Allemant Messiere Bernard Conte de la Marche Trevisane sur le mesme subgiect*[38]. Significantly, Practique depicts himself as a sort of *souffleur*, an equivalent of the ignorant alchemist blundering from one hopeless experiment to another. For the alchemical biography is a two-edged weapon, the instrument both of adepts wishing to demonstrate to novices that the right way is easily lost, and of satirists mocking the folly of those that waste their substance looking for the Philosophers' stone. The exemplary stories of Zacaire and of Bernard of Treves fit into the former category, as does the picture of the stupid and dishonest puffer in Sendivogius's *Dialogus Mercurii, Alchymistae et Naturae*. On the other hand, the satirists take as their motto the affirmation by Du Gault:

> "La corde, l'hospital, le deshonneur publique
> Sont les loyers certains du but philosophique:"[39]

As Professor Read's *The Alchemist in Life, Literature and Art* amply shows, these themes found pictorial representation as well. In the case of Pieter Brueghel the Elder's famous picture, engraved by Cock and Theodore Galle, the distinction between puffer and philosopher seems to be still observed[40]. Practique, desirous of dissuading Théorique from undertaking the search for the secrets of the potter's art, yet aggressively sure of the value of his craft, appears to be caught in the ambivalence that contributed to the favour of these *motifs* with artists and writers.

Just as one can see in Ronsard's poetic evocation of the alchemist, eternal deceiver of himself[41], a verbal counterpart of the painters' cliché of the alchemical laboratory, so, too, one can point to common elements in Brueghel's satire and in Palissy's supposed true confession. The potter's wife and family are ever present in his narrative, constantly reproaching him with the poverty to which his stubborn quest had reduced them[42]. Practique admits: "je trouvois en ma chambre une seconde persécution pire que la

[38] Antwerp, G. Sylvius, in –8°. A new edition was published in Lyons in 1574 (B. Rigaud, in –16).

[39] *Palinodie chimique: ou les erreurs de cest art sont non moins plaisamment, que serieusement refutez par le Sieur du Gault*, Paris, Pierre Sevestre, 1588, in –4°, f. 36 r.

[40] John Read, *The Alchemist in Life, Literature and Art*, London, Nelson, 1947, pp. 63–6.

[41] Quoted by M. A.-M. Schmidt in *La Poésie scientifique en France au seizième siècle* (Paris, Albin Michel, 1938), p. 317.

[42] *Les Œuvres* . . ., pp. 383, 387, 389.

première"[43]. Brueghel relies on the eloquence of gesture to indicate the plight of the puffer's wife and children. In his alchemist's house the kitchen and its utensils have been absorbed into the work of the laboratory: Palissy goes further. In perhaps the best remembered passage of the *Discours admirables* he tells how he sacrificed furniture and even floorboards to his kiln[44]. The theme of poverty and social degradation, inevitable concomitants of devotion to the art, is developed at length throughout the account. To this extent Palissy exploits the satirists' view of the Philosophers.

For other *motifs* the comparisons can more profitably be made with alchemical biographies as written by the adepts themselves. The constant emphasis on the passage of time (years of fruitless researches here, days and nights, even months, of vigils or sufferings there[45]) echoes a similar preoccupation in the stories of Bernard of Treves, of Denis Zacaire and even of Nicolas Flamel[46]. Practique is at the outset "comme un homme qui taste en ténèbres"[47], having only the most rudimentary notion of the methods he should follow. Hence the errors he commits in seeking the right ingredients for his glaze and the correct proportion of the mixture. But he is ignorant, also, of the construction of kilns and of the required degrees of heat. Like Sendivogius's puffer he is at first inclined to put "le blasme sus les matières"[48]. With no manual to guide him he can but proceed by eliminating all the processes that have borne no fruit. The successful overcoming of one hurdle confronts him with new possibilities of mistakes and accidents. Following in the wake of all alchemical novices he does not fail to make all possible blunders. If his patience and single-mindedness are at last rewarded, it is because he has the confidence that comes from the knowledge that God is watching his efforts with sympathy[49]. However, this theme is not stressed as it often is in alchemical treatises.

[43] *Les Œuvres . . .*, p. 390.

[44] *Ibid.*, p. 383.

[45] *Ibid.*, p. 380 *et passim.*

[46] *Cf. Trois traictez de la philosophie naturelle, non encore imprimez. sçavoir, Le secret livre du tres-ancien Philosophe Artephius, . . . plus les figures hierogliphiques de Nicolas Flamel . . .*, Paris, V^ve^ M. Guillemot & S. Thiboust, 1612, in –4°.

[47] *Les Œuvres . . .*, p. 379.

[48] *Ibid.*, p. 380.

[49] *Ibid.*, p. 381.

The fundamental lesson of the whole narrative is that mastery of the art depends on mastery of fire, on "gouvernement du feu"[50]. Practique states it himself:

> "Car il faut que tu sçaches que pour bien conduire une fournée de besongne, mesmement quand elle est esmaillée, il faut gouverner le feu par une philosophie si soingneuse qu'il n'y soit bien travaillé, et bien souvent déceu. Quant à la manière de bien enfourner, il y est requis une singulière géométrie."[51]

Precedents for such declarations are not lacking, of coursé. Calid says for example:

> "Et qui lire le voudra, voye de la Geometrie, & apprenne ses mesures, affin qu'il scache bien & droictement composer la fabrique des fours, & n'excede point leur mode & facon par augmentation ou diminution, & qu'il scache la quantité des feus, & la facon & la qualité du vaisseau de l'oeuvre."[52]

As in other alchemical biographies, Palissy's readers are shown how the artist learns from painful experience what not to do in this technique that is vital both to the Philosopher and to the potter. To begin with, Practique proceeds quite arbitrarily:

> ". . . ayant faict un fourneau à ma fantasie, je mettois cuire lesdites pièces pour voir si mes drogues pourroyent faire quelques couleurs de blanc:"[53]

Later he comes to recognize that one must be able to foresee the consequences of a particular process, to construct adequate kilns, to distinguish between the degrees of fire—for example, those suitable for the glassmaker and those useful for the potter. It is this apprenticeship, this noviciate, that one must have the courage to undergo.

The student of alchemical literature will not be surprised to learn that Practique does not in fact reveal the secrets of the art of pottery. The elaborate precautions, the almost prolix account of his sufferings that Palissy presents, these do not satisfy Théorique. He complains he has been told nothing and still refuses to be content with a mere list of ingredients rattled off—almost

[50] *Les Œuvres* . . ., p. 392.

[51] *Loc. cit.*

[52] *Le Miroir d'alquimie de Rogier Bacon* . . ., 1st part, pp. 63–4.

[53] *Les Œuvres* . . ., p. 379.

with bad grace—by Practique[54]. The latter's rejoinder makes quite clear Palissy's purpose in *De l'Art de terre*:

> "Les fautes que j'ay faites en mettant mes esmaux en doze, m'ont plus apprins que non pas les choses qui se sont bien trouvées: parquoy je suis d'advis que tu travailles pour chercher laditte doze, aussi bien que j'ay fait, autrement tu aurois trop bon marché de la science, et peut estre que ce seroit la cause de te la faire mépriser: car je sçay bien qu'il n'y a gens au monde qui facent bon marché des secrets et des arts, sinon ceux ausquels ils ne coustent guères: mais ceux qui les ont pratiquez à grands frais et labeurs ne les donnent ainsi légèrement."[55]

What Palissy is offering his readers is not a practical treatise on pottery, but an introduction to the state of mind, or rather of soul and spirit, that is a prerequisite for successful craftsmanship. Alchemical works, pursuing a not dissimilar object, employ the same trick of promising to give then withholding (or inextricably obscuring) what would seem to be the essential information. However, for Palissy it is the value of effort, of preparation through toil and suffering, that is essential. The fable of the potter's trials, like most alchemical biographies, has an almost religious resonance. Having made this point, Palissy can dissolve the initiatory situation by allowing the piqued Théorique to call pottery "un art méchanique, duquel on se peut passer aisément"[56]. Practique immediately retorts that his would-be disciple is obviously unworthy of being entrusted with the secret[57]. The long concluding eulogy of the "utilité"[58] of pottery ends characteristically, and perhaps significantly, with the statement that "plusieurs vaisseaux de terre ont esté consacrez pour le service des temples"[59]. The little drama of clashing conceptions of the artisan's function is thereby rounded off.

It is reasonable to ask how Palissy, always truculently apologizing for his lack of education, can be so familiar with alchemical literature. Can such skilful exploitation of the Philosophers' themes be the work of a humble craftsman bereft of Latin and Greek? After Duhem and Professor Thorndike, it is hardly necessary to urge caution in accepting Palissy's own description of his ignorance. Nevertheless, an examination of the potter's reading in alchemy,

[54] *Les Œuvres . . .*, p. 391.

[55] *Loc. cit.*

[56] *Ibid.*, p. 392.

[57] *Loc. cit.*

[58] *Ibid.*, p. 393.

[59] *Ibid.*, p. 394.

relatively neglected in the most recent review of his sources[60], seems called for.

Ignorance of Latin (it can be assumed that Palissy is substantially accurate in this claim) does not necessarily mean, before 1580, inability to read the Ancients or the literature of medicine. To write "je n'ay rien veu des livres des Médecins"[61] and "je ne puis lire en Aristote"[62] is to court contradiction. By the time the *Discours admirables* were published many medical writers had been translated. Others were writing directly in French[63]. Palissy, careless even of the bibliographical standards of his own day, is often content to refer vaguely to "quelque auteur" as his source[64]. Yet he furnishes his readers with a small list of alchemical writers, three of whom do not seem to have been translated—in published works—in the potter's lifetime.

The apocryphal works on alchemical subjects of Geber (Jabir), Arnold of Villanova and Ramon Lully, mentioned more than once by Palissy[65], were available only in Latin in 1580[66]. Must one then assume that he is merely quoting the names?[67] The context of the first mention strongly suggests the alchemical theme of the adept triumphing over the misleading dissension of the philosophers and probing Nature's secrets successfully thanks to the grace of God:

> "Et par ce que plusieurs souz un beau Latin ou autre langage bien poli ont laissé plusieurs talents pernicieux pour abuser et faire perdre le temps à la jeunesse: qu'ainsi ne soit, un Geber, un Roman de la Roze et un Raimond Lule, et aucuns disciples de Paracelse, et plusieurs autres alchimistes ont laissé des livres à l'estude desquels plusieurs ont perdu et leur temps et leurs biens. Tels livres pernicieux m'ont causé gratter la terre l'espace de quarante ans et foüiller les entrailles d'icelle, à fin de connoistre les choses qu'elle produit dans soy, et par tel moyen j'ay trouvé grâce devant Dieu qui m'a fait connoistre des secrets qui ont esté jusques à présent inconnuz aux hommes, voire aux plus doctes, comme l'on pourra connoistre par mes escrits contenuz en ce livres"[68].

[60] *Cf. The Admirable Discourses of Bernard Palissy*, pp. 10 *sqq.*

[61] *Les Œuvres . . .*, p. 74.

[62] *Ibid.*, pp. 345–6.

[63] *Cf.* Howard Stone, *The French Language in Renaissance Medicine* in *Bibliothèque d'Humanisme et Renaissance*, t.XV, 1953, pp. 315–346.

[64] *Les Œuvres . . .*, pp. 200, 285.

[65] *Ibid.*, pp. 164, 234–5.

[66] At least no French versions are recorded in Ferguson's *Bibliotheca Chemica*.

[67] *Cf. The Admirable Discourses of Bernard Palissy*, pp. 10–11 (an exception is made, curiously, for Lully).

[68] *Les Œuvres . . .*, pp. 163–4.

The later mentions are no more precise in their reference. But, as always, Palissy is hiding his hand. Since speculation is the critic's only resource here, one might just as easily suppose that the potter had access to manuscript translations of the great classics of alchemy. Examples of such manuscripts, in French translations of the fifteenth and sixteenth centuries, are not lacking[69]. E. Dupuy[70] instances several French translations of early texts that Palissy utilized. And Gohory states in 1561: "Un seul R. Lulle nous ha laissé environ 500 volumes de tel artifice si Lacinius est veritable; aumoins en voions nous beaucoup tant Impriméz que escriptz ala main"[71].

The historian is perhaps on safer ground with the *Roman de la Rose*. That this work should be mentioned in a list of alchemical authors is no accident. In his preface to *De la transformation metallique* Gohory explains:

> "J'ay aussi extraict & joinct au dessusdict livre, un lieu d'iceluy Romant, auquel ledict de Meung tracte manifectement de l'art susdict, & à cause duquel seul, plusieurs achaptent ledict Romant."[72]

What a manuscript tradition had established, Gohory's edition confirmed. Palissy's reference may well be to both. It must be remembered, too, that this is only one of several alchemical works or collections published in French before 1580. Indeed the period is one of intense interest in alchemy, an interest that Palissy certainly shared. The competence of his discussion of alchemical theories, to which he devotes many pages of the *Discours admirables*, is sufficient indication of his curiosity in this direction. Therefore it is not surprising that he, too, felt the impact of the writer who dominated alchemical thinking after 1560: Paracelsus.

[69] See James Corbett, *Catalogue des manuscrits alchimiques latins*, I (1939), II (1951), *passim*.

[70] See Ernest Dupuy, *Bernard Palissy*, Soc. française d'Imprimerie et de Librairie, Paris, 1902.

[71] See *Defense de la science vulgairement appellee alchymie, & des honnestes personages qui vaquent à elle: contre les effortz que J. Girard mect à les oultrager* in *De la transformation metallique, trois anciens tractez en rithme Françoise. A scavoir. La fontaine des amoureux de science: autheur J. De la Fontaine. Les Remonstrances de Nature à Lalchymiste errant: avec la response dudict Alchy. par J. de Meung. Ensemble un tracté de son Romant de la Rose, concernant ledict art. Le Sommaire Philosophique de N. Flamel. Avec La defense diceluy art & des honestes personages qui y vaquent: Contre les effortz que J. Girard mect à les oultrager*, Paris, G. Guillard & A. Warancore, 1561, in –8°, f. 70r. See also the preface to *Trois traitez de la philosophie naturelle, non encores imprimez; sçavoir, La Turbe des Philosophes, . . .*, Paris, Jean Sara, 1618, in –8°.

[72] *De la transformation metallique*, f. A3$^{v}$.

Again Palissy's vagueness is an obstacle to determining what he had read. In the main one can only suggest what he might have read. Certainly, little of the Paracelsian canon proper was available in French[73]. Who are the "aucuns disciples de Paracelse"? Roch le Baillif perhaps[74], or more probably Jacques Gohory, "le premier fauteur du Paracelsisme en France," as Gabriel Naudé notes[75]. After 1570, some acquaintance with Paracelsus, in Latin texts usually, is claimed by and can be assumed in many writers on alchemy or medicine. Palissy himself refers to "un livre imprimé depuis n'aguères, et qui dit que le Paracelse, médecin Alemand, médecinalement a guari un nombre de ladres par le moyen de l'or potable"[76].

When the potter remarks:

> "il fut imprimé à Lyon un livre de l'or potable, du temps que le Roy Henry troisième y estoit à son retour de Polongne, auquel livre est clairement escrit que l'alchimie ne doit estre révélée sinon aux enfants de philosophie:"[77]

it is less difficult to see he means Alexandre de la Tourrète's *Bref discours des admirables vertus de l'or-potable: auquel sont traictez les principaux fondemens de la medecine, l'origine & cause de toutes maladies, & quels sont les medicamens plus propres à leur guerison, & à la conservation de la santé humaine . . . Avec une apologie de la tresutile science d'Alchimie, tant contre ceux qui la blasment, qu'aussi contre les faulsaires, larrons & trompeurs qui en abusent, . . .*[78]. Although this work is in the Paracelsian tradition, it provoked a rejoinder from Gohory, who remained zealous in defending the older tradition of alchemy: *Discours responsif à celuy d'Alexandre de la Tourrete, sur les secrets de l'art Chymique & confection de l'Or-potable, faict en la defense de la Philosophie & Medecine antique, contre la nouvelle Paracelsique*[79]. These are the complex debates that are the background of Palissy's study of the Hermetic art.

[73] *Cf.* Karl Sudhoff, *Bibliographia Paracelsica*, Graz, Akademische Druck- u. Verlagsanstalt, 1958, pp. 126 *sqq.*, 181–2, 314–5.

[74] See *Le Demosterion de Roch le Baillif Edelphe Medecin Spagiric . . . Sommaire veritable de la Medecine Paracelsique . . .*, Rennes, P. le Bret, 1578, in –4°.

[75] *Apologie pour tous les grands personnages qui ont esté faussement soupçonnez de Magie*, The Hague, Adrian Vlac, 1653, in –8°, p. 394.

[76] *Les Œuvres . . .*, p. 278.

[77] *Ibid.*, p. 260.

[78] Lyons, Pierre Roussin, 1575, in –12.

[79] Paris, Jean de L'Astre, 1575, in –12. The same printer had reprinted La Tourrète's work.

As one would expect, Palissy's acquaintance with alchemy is not confined to reading, however much more important this activity is than the potter would like his public to think. He records traditions of celebrated adepts of his time[80], recounts the conversations he has had with puffers and would-be Philosophers on various aspects of their art[81]. Much information, many ideas were communicated orally. In the Paris of the last Valois kings, intellectual exchange did not exclude the sciences. Gohory had debated Paracelsism with a number of medical men[82], including Paré, who attended Palissy's lectures[83]. Palissy's friend, Race the surgeon[84], visited Gohory's "Lycium philosophal San Marcellin"[85]. In other words, the potter had ample opportunities in conversation or discussion with the leading students of natural philosophy to fill in the gaps in his knowledge of scientific subjects. Living and working in this milieu he could not fail to acquire a considerable alchemical culture, familiarity with both the ideas and the literary techniques of the Philosophers.

To have shown that the section *De L'Art de terre* is largely inspired by alchemical literature in its form, and in many of its themes, is not to prove that it is in any exact sense Hermetic in substance. Palissy's knowledge of the adepts' works enabled him to recognize analogies between pottery and alchemy, seen as an art of mastering fire, and to transfer to his own craft the expository and intiatory techniques of the hermetists. In reality, one of his principal criticisms of alchemy is that it attempts the generation of metals through fire, when he has established by observation that it is the action of water in the earth that brings about the formation of stones and minerals[86]. As a philosopher he adheres to an hypothesis diametrically opposed to that of the alchemists. Fire's role (and therefore man's) is limited to melting and purifying metals for useful purposes[87]. The mystery of the fifth element, the "eau congélative", is in God's hands[88]. Processes that are necessary in pottery

[80] *Les Œuvres . . .*, pp. 236–7, 432.

[81] *Ibid.*, pp. 70, 244, 428.

[82] *Cf.* D. P. Walker, *Spiritual and Demonic Magic from Ficino to Campanella*, London, The Warburg Institute, 1958, p. 101.

[83] *Les Œuvres . . .*, p. 330.

[84] *Ibid.*, pp. 250, 269, 345.

[85] *Cf.* E.-T. Hamy, *Un précurseur de Guy de La Brosse. Jacques Gohory et le Lycium philosophal de Saint-Marceau-lès-Paris* (1571–1576) in *Nouvelles archives du Muséum d'histoire naturelle*, 4e série, t.I, 1899, p. 18.

[86] *Les Œuvres . . .*, pp. 231 *sqq.*: *Traité des métaux et alchimie.*

[87] *Ibid.*, p. 237.

[88] *Ibid.*, pp. 404–408.

are useless and mistaken in alchemy. Thus the Philosophers' vigil over their furnaces—evoked in terms reminiscent of Palissy's so-called autobiography[89]—is quite hopeless. No doubt this clear and consistent philosophical position allows Palissy to substitute his white enamel for the alchemists' tincture as the object of the mastery of fire without any sense of confusion. His borrowings are formal, stylistic.

It is on this plane that the adaptation of alchemical biography to Practique's narrative must be considered. That Palissy has resorted to artifice need not condemn him as a liar. His achievement in pottery may or may not have been the result of struggles such as Practique describes. There are no documents, no outside sources of information, as yet no means of verification. Certain details of the narrative obviously apply to Palissy's own life, for example the professional skills that enable the experimenter to interrupt his search and retrieve his financial position from time to time[90]. If this is a lie it is at least a circumstantial one. But the conscientious historian must resign himself to ignorance or guarded conjecture until acceptable objective evidence appears. What is sure, is that the celebrated account is essentially a work of art.

Such a conclusion needs no justification where Renaissance science is concerned. The frontiers of literature and philosophy, in its sixteenth century encyclopaedic sense, are ill defined. Naturally, this goes beyond merely episodic use of fiction, as in the miniature *conte* (a genre much practised by his contemporaries) that Palissy inserts in the *Discours admirables* to demonstrate the possibilities of medical trickery[91]. The vogue of the *Hypnerotomachia Poliphili* in the sixteenth century and even later[92] is symptomatic of a fondness for allegory and oblique statement. The fascination of this text extended to Palissy, though he protests, not altogether convincingly, that it did not inspire the garden plan in the *Recepte véritable*[93]. Familiar then with this culture that recognizes fully the power of symbols, Palissy does not hesitate to put literary artifice to use in presenting scientific theories. In the hands of the adepts the alchemical biography is not intended to arouse pity or scorn simply. It is charged with symbolical significance, an invitation to meditate on the spiritual and technical requirements of devotion to the art. Hence the

[89] *Les Œuvres . . .*, pp. 236–7.

[90] *Ibid.*, pp. 380–1.

[91] *Ibid.*, pp. 279–80.

[92] *Cf.* Anthony Blunt, *The "Hynerotomachia Poliphili" in 17th century France* in *Journal of the Warburg Institute*, vol. I, 1937, pp. 117–137.

[93] *Les Œuvres . . .*, p. 12.

adventures of a Nicolas Flamel serve a lofty pedagogical purpose[94]. Transposing this formula to the potter's craft Palissy creates a powerful myth of the artisan.

It should be evident that Palissy's skill in handling these themes presupposes a degree of sophistication with which he is not usually credited. Yet poor, naïve craftsman that he purports to be, he achieves nonetheless something of that detachment that seems to distinguish Renaissance scientific speculation. Ideas are, up to a point, there to be toyed with. However persuaded one may be of the correctness of some intuition, one hesitates to forget its opposite. Certainty is constantly tempered with doubt. For this reason, Palissy, a declared adversary of alchemy, can retain enough imaginative sympathy to understand the Philosophers' myths. Similarly, he can defend a thesis "par manière de dispute", in order to provoke thought[95]. In this world of conventions and artifices, where science is at the same time literature, it is hard to see the Palissy of *De l'Art de terre* as a lone precursor of modern methodology.

Much of Palissy's reputation for modernity is based on his opposition to alchemy. However, it is instructive to see why he condemned the belief in the Philosophers' stone at a time when, sparked off by the rise of Paracelsism, a great debate on the value of the Science of Hermes was in progress[96]. The theoretical basis for his argument is an almost obsessive intuition that water, and not fire, is responsible for the formation of all metals. Though this thesis is supported by alleged observations and by numerous samples from private collections of natural objects[97], it is most difficult to accept this as a modern criticism of alchemy. Common sense, the ability to see through the ruses of puffers[98], cupellation[99], these are the qualities and techniques that justify in some measure the credit given to Palissy. But in 1580 alchemy and chemistry are still inextricably interwoven. The distinctions of materials, aims and methods that can be and are made are not modern ones. Palissy, for instance, observes the difference between charlatans and forgers on the one hand, and natural philosophers on the other[100]. An alchemical text, roughly contemporaneous with the *Discours admirables* and in the Paracelsian tradition,

[94] *Cf.* Eugène Canseliet, *Nicolas Flamel* in *La Tour Saint-Jacques*, **2**, pp. 13–22, and **3**, pp. 63–77.

[95] *Les Œuvres . . .*, pp. 283–4.

[96] See L. Thorndike, *op.cit.*, t. VI, ch. XXXVII, pp. 238–53.

[97] *Les Œuvres . . .*, p. 269.

[98] *Ibid.*, pp. 242 *sqq.*

[99] *Ibid.*, p. 245.

[100] *Ibid.*, pp. 258–60.

accepts the same view[101]. In so far as the true alchemist sees his art as a means of investigating Nature's secrets and not as the road to riches, he is not to be distinguished from Palissy. The potter's picture of the social chaos successful goldmaking would cause is an alchemical argument for keeping the secret for an élite[102]. In his very language Palissy hardly escapes from the animism of those he criticizes, so much so that he twits himself with it in the *Recepte véritable*[103]. But it is the preamble to the *Traité des métaux et alchimie* that indicates most clearly the peculiarity of Palissy's position. Ready to condemn all puffers, unable himself to believe in transmutation, he spares those that pursue the search disinterestedly, including "toutes espèces de physiciens, ausquels est requis de connoistre les natures"[104]. He even—ironically or prudently?—admits the possibility that his opponents are right:

> "et s'il y a quelqu'un qui aye tant fait par son labeur qu'il ait esmeu la charité de Dieu à luy révéler un tel secret, je n'entend parler de tels personnages:"[105]

It would be rash indeed to claim that Palissy's arguments against alchemy destroy the very foundation of that philosophy. To the end his attitude remains ambivalent.

Like many other Renaissance natural philosophers, Palissy pays homage to the virtues of observation and experience and derides mere book-learning, nowhere more eloquently than in the preface to the *Discours admirables*[106]. What is often forgotten is that avowed Hermetists, the author of *Des Eléments chymiques et spagyriques de l'Esprit du Monde* for example, can profess the same principles[107]. They, too, are capable of affirming: "je contente la veuë, l'ouye et l'atouchement", and of appealing to observations, personal experiences and samples collected. Gabriel de Castaigne lists his expert witnesses[108] as

[101] Bibl. nat. et univ. de Strasbourg, MS 368: "Des Eléments chymiques et spagyriques de l'Esprit du Monde", XVIIIth century copy of a text written probably between 1580 and 1600. *Cf.* pp. XXVII–XXX.

[102] *Cf.* Nuysement, *Poëme philosophic* . . ., Paris, J. Périer & A. Buisard, 1620, in –8°, pp. 40–41.

[103] *Les Œuvres* . . ., pp. 35–6.

[104] *Ibid.*, p. 232.

[105] *Loc. cit.*

[106] *Ibid.*, p. 166.

[107] Strasbourg MS 368, pp. 251 *sqq.*

[108] *Les Œuvres du R. P. Gabriel de Castaigne, tant medicinales que chymiques,* . . ., Paris, Jean d'Hourry, 1661, in –8°, *passim.*

assiduously as Palissy lists the subscribers to his lectures[109]. In fact, alchemists and venerated ancestors of empiricism, all live by the same faith in the observation of Nature. Only those unacquainted with the scientific literature of the period could give these fine phrases their twentieth century meanings.

It is far more profitable to set Palissy amongst his contemporaries, alongside the apothecary Nicolas Houel, author of a *Traité de la thériaque et mithridat*[110] (which does not fail to prefer direct experience of natural phenomena to the authority of the Ancients[111]), and founder of the *Maison de Charité chrétienne*,[112] or the polygraph Jacques Gohory whose *Lycium philosophal* Houel's institution may have replaced[113]. Palissy, who "louë grandement les distillateurs et tireurs d'essences"[114], proposes in the *Recepte véritable* a plan of a garden where provision is made for a "librairie et estude" and for "certains fourneaux, à tirer les eaux et essences des herbes de bonne senteur"[115]. Is this an imaginary ancestor of the gardens established by Gohory and Houel? It would seem that it is rather a matter of convergent curiosities. The years that preceded the publication of the *Discours admirables* saw the establishment of Baïf's Academy, last splendid flowering in France of the philosophical and artistic culture of the Renaissance[116]. Among the learned Academicians were two of Palissy's subscribers "Monsieur d'Albène et l'abbé d'Albène son frère"[117]. Caught up in what may yet prove to have been a more generally, or at least fashionably, followed movement than is now supposed, Palissy gives his own museum or "cabinet" the title of "petite Académie"[118]. In the still very much circumscribed intellectual world of sixteenth-century Paris, where it was possible, as we forget too often, but as L'Estoile's capacious collection of gossip should remind us, to know most of what was happening, there was clearly widespread enthusiasm for discussion and collective effort in natural philosophy. The plans were, no doubt, not realized until the following century. However, the

[109] *Les Œuvres . . .*, pp. 329–30.

[110] Paris, Jean de Bordeaux, 1573, in –8°.

[111] *Ibid.*, ff. c2$^{v}$–c3$^{r}$.

[112] See Frances A. Yates, *Dramatic Religious Processions in Paris in the late sixteenth century* in *Annales Musicologiques*, t.II, 1954, pp. 215–270.

[113] Walker, *op. cit.*, p. 100.

[114] *Les Œuvres . . .*, p. 258.

[115] *Ibid.*, p. 96.

[116] See F. A. Yates, *The French Academies of the Sixteenth Century*, London, The Warburg Institute, 1947.

[117] *Les Œuvres . . .*, p. 330.

[118] *Ibid.*, p. 167.

fact that they existed at all is a warning not to consider Bacon's Paris years in relation to Palissy alone[119]. The civilization that helped to form the mind of the future philosopher was also that into which the potter was perfectly integrated.

To correct the popular, and even learned, image of Palissy, it is not enough to doubt the accuracy of his supposed autobiography. It is time to remember that for a work of "craft-description"[120] the *Discours admirables* are singularly uninformative. To be sure, Palissy presents himself constantly as a craftsman, because he believes that that training gives him a particular authority for interpreting the works of Nature. However deficient and indigent his scientific theories may be, the substance of his work is an essay in Renaissance philosophy. But it holds a deeper lesson. Heir to a long tradition that was not afraid to envelop what it believed to be truths in myths, Palissy creates the legend of the craftsman-philosopher, tenacious communer with all the phenomena of the visible and tangible world, and ultimately seeker after God. When one recalls the mottoes of the garden described in the *Recepte véritable*[121], Practique's definition of the philosopher takes on its full significance:

> "philosophe veut dire amateur de sapience. Or Dieu est sapience: l'on ne peut donc aimer sapience sans aimer Dieu"[122].

The legend of Palissy leads the philosopher through the trials of art to understanding of nature and finally to communion with God.

> "Dieu, la Nature, & l'Art, Triade incomparable,
> Ravissent tout esprit en l'admiration
> Du dessein, du labeur, de la perfection,
> Où reluit de tous Trois la puissance incroyable".[123]

as the alchemical sonnet has it. But another age, less conversant with the ambitions of Renaissance (and alchemical) philosophy, has preferred to perpetuate the myth by impoverishing it.

[119] See Alexander Bruno Hanschmann, *Bernard Palissy, der Künstler, Naturforscher und Schriftsteller als Vater der induktiven Wissenschaftsmethode des Bacon von Verulam*, Leipzig, Dieterich'sche Verlagsbuchhandlung, 1903; Allbutt, article quoted; B. Farrington, *op. cit.*, pp. 13–15; Paolo Rossi, *Francesco Bacone: dalla magia alla scienza*, Bari, Laterza, 1957, pp. 41–3.

[120] *Cf.* Rupert Hall, *The Scholar and Craftsman in the Scientific Revolution* in *Critical Problems in the History of Science*, ed. M. Clagett, Madison, The University of Wisconsin Press, 1959, pp. 17–18.

[121] *Les Œuvres . . .*, pp. 78–82, 91–95, 100.

[122] *Ibid.*, p. 259.

[123] Nuysement, *Traittez du vray sel . . .*, Paris, J. Périer & A. Buisard, 1621, in –8°, f.*B$^{v}$.

# THE BEGINNING OF ARAB ALCHEMY*

By Mohamed Yahia Haschmi†

In his *Kosmos*, Alexander von Humboldt expresses the view that the most important contribution by the Arabs to the natural sciences was their work in Chemistry[1]. The accomplishments of the Arabs are, in his opinion, of such significance that he feels justified to say that they opened up a new branch of the natural sciences.

As yet, the source of Arab chemistry has not been established. It could derive from a number of earlier civilizations: from the ancient technical skills of the Egyptians, from the recipes originating in Babylonia and Assyria, from the alchemistic prescriptions of Pseudo-Democritus and of the sophist Synesius, from Chinese knowledge transmitted by the mongols. Very little progress has been made over the past hundred years in the exploration of the beginnings of Arab Alchemy.

It is therefore an intriguing task to investigate its origin. Today as Ganzenmüller states, we no longer look at Alchemy as an obscure precursor of chemistry, and even less as an aberration of science, but as a living branch of the tree of human evolution, influenced and pervaded by all the forces shaping life[2].

At a very early time, the Arabs had become acquainted with the philosophy of the Greeks, with the wisdom of India, with the astronomy of the Babylonians, and with the literature of the Persians[3]. Alchemy was part of all these disciplines, and has left its marks in traditional Arab legends.

Pliny and Plutarch call chemistry an Egyptian art[4]. This would support the assumption that Egypt, especially Alexandria, was the determining

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[1] Alexander von Humboldt, *Kosmos*, Stuttgart, 1844, II, p. 177. *Cf.* M. Y. Haschmi, *Chemiker Zeitung*, 1958, 82.

[2] W. Ganzenmüller, *Beiträge zur Geschichte der Technologie und der Alchemie*, Weinheim, 1956, p. 360.

[3] A. Metz, *Die Renaissance des Islam*, Heidelberg, 1922.

[4] Alexander von Humboldt, *loc. cit.*, note 133, p. 306. E. J. Holmyard, "Alchemy in medieval Islam", in *Endeavour*, Vol. XIV, No. 55, July, 1955: "The earliest alchemical treaties come from Hellenistic Egypt. Perhaps the most ancient of them is *Physika kai Mystika*, 'Physical and Mystical Matters' of an author writing under the name of Demokritos; he probably lived in the 2nd century A.D.".

influence in the shaping of Arab Alchemy. Ruska, however, claims that the school of chemistry originating in the cities of the Sassanid empire differed materially from the Alexandrian type[5]. The as yet little known historic period of the transition from the Hellenic to the Arab civilization has to be better explored before the question of the first appearance of Alchemy in the Arab cultural development can be answered.

The oldest information on Arab Alchemy goes back to the omayyad prince Khalid ibn Yazid who died in A.D. 704. He is said to have ordered the translation of a Greek book, "The Wisdom of Krates", which bears the Arab title "Kitab Qaratis ul-Hikma", and contains discussions on Alchemy[6]. Ruska, however, believes that this translation was made at a later date[7].

The relation between Ja'far al-Sadiq, the 6th shi'itic Imam and the Alchemist Jabir ibn Hayyan, said to date back to the 8th century[8] are considered a later forgery by J. Ruska and P. Kraus[9]. Jabir mentioned the Imam frequently in his writings. I have discussed the problem of the relation between both men in my book *Al- Imam al-Sadiq as an Aspirant to Alchemy* (in Arabic[10]). A connexion is possible in principle because the writings of Jabir about Ja'far deal only with religious and ethical problems, and are not

[5] J. Ruska, *Die bisherigen Versuche das Dschabirproblem zu lösen, Forschungsinst für Geschichte der Naturw.*, III, *Jahresbericht*, Berlin, 1930, pp. 19–20. W. Ganzenmüller, *loc. cit.*, p. 363.

[6] E. J. Holmyard, *loc. cit.*, p. 118: "According to al-Nadim, a 10th-century biographer, the first Muslim to interest himself in alchemy was Khalid ibn Yazid (d. 704), a son of the royal house but never himself Commander of the Faithful. . . . Some Arabic Alchemical works ascribed to Khalid are still in existence but not yet been closely studied".

[7] J. Ruska, *Arabische Alchemisten*, I. Heidelberg, 1924, p. 1, etc.

[8] E. J. Holmyard, *loc. cit.*, p. 118: "The life and works of this master of the art have presented a very difficult historical problem, which, however, research carried out during the last fifteen years has gone far to solve. There seems no reason to doubt that at the court of Harun al-Rashid there was an alchemist named Jabir ibn Hayyan al-Sufi, the son of a druggist of Kufa. As a young man he enjoyed the patronage of the 6th Iman Ja'far al-Sadiq. . . . He was probably born in 721 or 722 . . . he is said to have survived the banishment of the Barmecides in 803. . . . Difficulties begin to arise when consideration is given to the very numerous treatises on alchemy that pass under his name. . . . How much of the alchemical operations and theory described in it is of the 8th century and how much of the 10th must remain a matter of conjecture".

Leo Africanus (15th century) says that Geber living 100 years after the Prophet Mohammed, see K. C. Schmieder, *Geschichte der Alchemie*, Ulm-Donau, 1959, pp. 107–108.

[9] Ref. 5, pp. 9 and 23.

[10] M. Y. Haschmi, *Imam al-Sadiq* as Inspirator of Alchemy (in Arabic), II, edition Aleppo, 1950, pp. 53, 78.

concerned with experimental details. Jabir's quotations of Ja'far agree with the traditional views of the Imam about oneness and justice of God[11].

We know nothing about the person of Jabir. It is not even established whether there was actually a man of this name. If he existed, we do not know whether he wrote all or any of the books bearing his name. It will be very difficult to settle this problem.

P. Kraus has tried to prove the connexion between Jabir's writing and the Isma'yliya sect by comparison of the texts. He concludes that the author of the Jabir writings knew and used the doctrines of the Isma'yliya, and dates these doctrines to the second half of the 9th century. If Jabir should actually prove to be the first writer on Arab Alchemy, it would in Kraus' opinion be impossible to accept Alchemy as part of the Arab Knowledge before the date just mentioned[12]. The same conclusions hold true if the author was not a man named Jabir but some unknown writer.

There are, however, a number of arguments proving at least the possibility of an earlier date for Arab Alchemy[13]:

(1) Al-Kindi has written a refutation of Alchemy, dating from the 9th century. The original is lost, but al-Mas'udi says that al-Kindi stressed the impossibility of the transmutation of the elements, and called the claim of the alchemists to make gold artificially a fraud[14]. Al-Kindi wrote also a book on the "Chemistry of Perfumes" which has a long tradition[15].

(2) The well-known philosopher, writer and polyhistor al-Jahiz, living in the 9th century, mentions an alchemist, Abu Hakim, as a contemporary of Harun al-Rashid, i.e. in the 8th century[16]. Al-Jahiz discusses problems of Alchemy such as the possibility of artificial creation of ammonia, gold-coloured brass, and glass. Such skills must have required a long tradition[17].

[11] M. Y. Haschmi, pp. 199–200, Ref. 10.

[12] See Ref. 5, pp. 38–39.

[13] M. Y. Haschmi, *Die Quellen des Steinbuches des Beruni*, Bonn, 1935. *Cf.* Ref. 10. p. 82.

[14] Mas'udi, *Muruj ad-Dahab* (prairies d'or), Paris, VIII, pp. 176–177. M. Y. Haschmi, *Die Quellen des Steinbuch des Beruni*, p. 17, note 3. Haschmi, *al-Kindi as an Arab Philosopher* and famous *Nature Scholar* (Arabic), *Literature and Art*, III, London, 1945, p. 85.

[15] We find a mesopotamian origin of al-Kindi's chemical knowledge, see M. Levey. *Chemistry and chemical Technology in Ancient Mesopotamia*, London, New York, Princeton, 1959, p. 39. See also Karl Garliers *al-Kindi's Buch über de Chemie des Parfüms*, Leipzig, 1948, p. 1, etc.

[16] Al-Jahiz, *The Animal-book* (in Arabic), Cairo, 1323–25 (A.H. III), pp. 119, 120. *Cf*, Haschmi, Ref. 10, p. 83.

[17] Al-Jahiz, Ref. 16, V, p. 106. *Cf.* Haschmi, Ref. 10, p. 83.

(3) The same al-Jahiz cites poems by Safoan which might have been written in the same period (8th century). These writings contain the names of minerals such as zarnikh (auripigment or arsenic sulphide), sulphur, mercury, anuk (tin), martak (lead oxide), marqashita (marcasite), nushadir (sal ammoniac), etc. These expressions occur likewise in the alchemical literature[18]. According to al-Jahiz we find only a few books which have no relation to Alchemy[19].

(4) In the book on specific properties by Jabir, the manufacture of varnish is described which serves to make silk water-repellent (according to Ruska). Jabir is said to have stated that he took this method from al-Fadl ibn Yahia ibn Barmak (765–804)[20].

(5) The Arab book on the two arts "fi'l-sina'atain" by al-Askari (died 1004)[21], contains a poem by al-Akhtal, who died 710, which mentions "elixir." This "elixir"[22] is a substance which improves everything it touches, ennobling the human spirit as well as transmuting base into precious metals. The allusion to transmutability proves that, at an early date, the Arab mind was preoccupied with Alchemy.

(6) Misinterpretations of Arab texts can be found in Kraus' translation. He interprets a passage of Jabir, where the latter explains a verse of the

[18] Al-Jahiz, *Book of Evidence* (in Arabic), Cairo, 1932, I, p. 38. *Cf.* Haschmi, Ref. 10, p. 83. For mercury and lead, see Zosimos the Panopolitan", in E. J. Holmyard, *Makers of Chemistry*, Oxford, 1937, p. 37. For the mention of mercury and lead by Dioskurides and Galen, see al-Beruni's stone-book, Ref. 29, p. 259, note 8. *Cf.* Ref. 13, pp. 38, 41.

[19] Two manuscripts related to al-Jahiz "on comprehending the creation" exist in London and Aleppo; both MSS. treat of drugs applied in Alchemy and contain: "The things have two prices; one for the men of science and another for the public": (A) London, British Museum, or. catalogue (Arabic) No. 3856 with the title: "Al-Ibar wal-Itibar", fol. 18–19; (B) in Aleppo, with the title: "al-Dala'el wal-Itibar" (Osmaniya No. 672), published by Sheikh Ragueb el-Tabbakh, Aleppo, 1928, p. 25. The same theme exists in a book with the title: "Tawhid el-Mufaddal", relating to al-Mufaddal as a disciple of Ja'far al-Sadiq (8th century), published in Najaf-Irak, 1955. We find that the last sentence, which is present in both manuscripts, and on pp. 150–151 of this book, mentions "Searcher of Alchemy". There is a Shi'itic gloss in the margin of the Aleppo manuscript, which has not been cited in the book published by Tabbakh.

[20] J. Ruska, "Chinesisch-arabische technische Rezepte aus der Zeit der Karolinger" *Chem. Zeitung*, Heidelberg, 1931, p. 55.

[21] *Al-Askari*. Istanbul, 1320 A.H., p. 235.

[22] M. Y. Haschmi, "Über das Elexier", *Chem. Zeitung*, Heidelberg, 1958, **5**, 3.

Koran[23], as implying that the Khalif Ali has the power to reverse the course of the sun. Actually the text does not infer any power over the sun, but merely describes a discussion about illusions arising from uncritical interpretation of natural events[24]. The public, says Jabir, see superficially, and erroneously, the direction of the motion, but the comprehender (Imam as Symbol) sees exactly; for this reason, the sun goes up from the west and not from the east. When, for example, as Jabir signifies, a wheel is in motion and a man is on it, he sees the earth is in contrary motion to that of the wheel[25].

(7) Kraus' thesis that the writings of Jabir contain a uniformly[26] rigid philosophy is not based on fact. Actually, there are widely different attitudes to be found in different books. The book of poisons, for instance, contains none of the religious tendencies and allusions to the 6th shi'itic Imam, which are common in the other works. Merely on the title-page, Jabir calls himself a pupil of this Imam, probably to indicate that he is a follower of his beliefs[27].

(8) The translator and editor of Jabir's book on poisons, A. Siggel, gives A.D. 1140 as the date of the Cairo edition. He has, however, overlooked the final sentence of the manuscript which says that it is a copy of a badly written manuscript dating to the year 139 of the Hijra (A.D. 756)[28].

(9) Al-Beruni, who died in A.D. 1048, uses Jabir's writing as his sources. Some of his quotations can be found in the existing books of Jabir. Al-Beruni, who proves his critical mind by stating that the so-called "Stone Book of Aristotle" is a forgery, accepts Jabir's writings as genuine[29].

(10) To Ruska, Kraus, von Lippmann, Ganzenmüller and other historians of Chemistry, the familiarity of the Arab Alchemists with Greek knowledge

[23] Koran (Surah II, Verse 258): "Bethink thee of him who had an argument with Abraham about his Lord, because Allah had given him the kingdom; how, when Abraham said: My Lord is He who giveth life and causeth death, he answered: I give life and cause death. Abraham said: Lo! Allah causeth the sun to rise in the East, so do thou cause it to come up from the West. Thus was the disbeliever abashed. And Allah guided not wrong-doing folk".

[24] Ref. 5, p. 34.

[25] P. Kraus, *Jabir ibn Hayyan*, I. textes choisies, Paris le Caire (in Arabic), 1935, p. 35. *Cf.* Ref. 10, p. 100.

[26] Ref. 5, p. 24.

[27] *Das Buch der Gifte des Gabir ibn Hayyan*, Wiesbaden, 1958 (arabic text), title.

[28] *Ibid.*, p. 193b (Arabic text).

[29] *al-Beruni's stone-book* (Arabic), Haidarabad—Deccan, 1355 A.H., pp. 169, 213. *Cf.* Ref. 13, p. 17.

appears puzzling. But the following facts may help to solve the riddle: Harith ibn Kilda who lived at the time of Mohammed and is said to be a contemporary of Mu'awiya (died 680), studied in Jundi Shapur[30] where Greek sciences had always been taught. Parts of the medical writings were translated from Syriac into Arabic during the dynasty of Omar ibn Abd el Aziz (died 721)[31]. From Jundi Shapur, Jirjis ibn Bukhtiashu' was summoned to Baghdad in 765. The Imam Ja'far al-Sadiq died at that time. Jirjis ibn Bukhtiashu' appointment to Baghdad is proof that an early connexion between both centres of learning existed[32]. Brockelmann also mentions a physician who lived at the court of al-Mansur (754–775) who translated medical texts into Arabic[33].

Ruska thinks the Omayyads lacked interest in Greek philosophy. Under al-Mansur, the situation changed and Greek sciences began to be cultivated and promoted. According to Ruska, Arab scientists and sciences could not have sprung from a void, and somewhere a haven must have existed where Greek culture survived, and from which al-Mansur was able to draw[34].

(11) Ruska claims that the translation of the book of Krates does not derive from Khalid ibn Yazid, who lived in the 7th century, and assumes the book to be 100 years later. If this should prove correct, it would be an additional proof for the existence of Arab Alchemy in the 8th century[35].

(12) The recently discovered Latin manuscript of the Compositions in the Capitular Library at Lucca (Italy), dating from the beginning of the 9th century, confirms the assumption that Arab Alchemy started in the 8th century. The codex contains a description on how to gild glass[36]. The method is reminiscent of a procedure for the making of ruby glass mentioned by al-Beruni which he takes from Jabir and which originated in Alexandria[37].

[30] *How Greek Science passed to the arabs,* by de Lacy O'Leray, London, 1948, pp. 13–14; see M. Y. Haschmi, "The roll of Jundi Shapur in arabic education" (Arabic), Etudes literaires, Université Libanaise, section de lalangue et lit. persanes, été, 1960, p. 187. *Cf.* Ref. 10, p. 70.

[31] *How Greek Science passed to the arabs, ibid.*, p. 150, Sa'eyed, Tabaqat el-Umam (in Arabic), Cairo, p. 75. *Cf.* J. Schacht—M. Meyerhof, "The Medico-Philosophical Controversy between Ibn Butlan of Baghdad and Ibn Ridwan of Cairo", Cairo, 1937, p. 7.

[32] Haschmi, Ref. 10, p. 80. *Cf.* M. Meyerhof, "Von Alexandrien nach Baghdad" in A. Badaoui, "The Greek Inheritance in the Islamic Culture", Cairo, 1940, p. 56 (in Arabic).

[33] Brockelmann, *Geschichte der Arabischen Literatur,* Leiden, 1943, I, p. 220.

[34] J. Ruska, Ref. 7, p. 5.

[35] *Ibid.*, p. 52.

[36] Ref. 2, p. 371.

[37] Al-Beruni's stone-book, Ref. 29, pp. 227–228. *Cf.* Ref. 13.17.

Until the discovery of this MS. it was not known that Latin manuscripts in Europe were written earlier than Arab works. Ganzenmüller has no doubts that the connexion between the preparation of Gold-ruby and the philosopher's stone rests on Arab influences[38].

From all these arguments, it seems evident that Arab Alchemistic literature starts in the 8th century. Hence it is quite possible that an alchemist of the name Jabir ibn Hayyan actually lived at that time. The original version of his writings remains, however, unknown.

The Arab literature on Alchemy spread into Spain in the 10th century through Maslama al-Majriti from Madrid, or exactly from late time through Pseudo-Majritic literature[39].

In the 13th century, Frater Elia translated the books by Jabir and Razi into Latin[40]. Elia had travelled in Syria and Egypt in connexion with his translation. The books were known in Barcelona in the 14th century[41]. From there, and from Italy, they found their way into the rest of Europe.

From the above discussion, one can conclude with a high degree of probability, that the beginnings of Arab Alchemy are older than assumed by Ruska and Kraus.

[38] Ref. 36.

[39] See M. Plessner, "Die Stellung des Picatrix innerhalb der spanischen Kulture", IX. Congresso International de Historia de la Ciencia, Barcelona-Madrid, 1–7 Sept., 1959, p. 312 *et seq.*

[40] Bruno Boni, "Frata Elia e l'Alchimia", Actes du VIII. Cóngrès International d'Histoire des Sciences, Florence-Milan, 3–9 Sept., 1956, Vol. II, p. 506. For Latin translation of Jabir ibn Hayyan, see Holmyard, Ref. 4, p. 25: "Taslimi says that there is a great deal of similarity between the ideas contained in the Nihayat (by Jildaki 14th century) and those found in the Latin works of Geber". See also, M. Taslimi. Thesis approved for the Ph.D. degree, University of London, 1954.

[41] Bruno Boni, *ibid.*, p. 542.

# GABRIEL PLATTES AND HIS CHEMICAL THEORY OF THE FORMATION OF THE EARTH'S CRUST

By Allen G. Debus*

To many in the sixteenth and seventeenth centuries Chemistry seemed to be the key that would unlock the major secrets of Nature. Chemical methods and chemical analogies are found everywhere in the literature of the period and to a large extent this is due to the influence of Paracelsus and his chemically oriented universe[1]. In the seventeenth century these Paracelsian mystical theories were given a new significance with the Helmontian writings which offered much Paracelsian thought in revised form. This is a period in which we find striking developments in new procedures for chemical analysis, in fruitful extensions of chemistry into medical theory and practice, and even into questions of geology[2]. All such specific cases were linked with the more general Paracelsian theories which renovated the ancient concepts of the macrocosm and the microcosm and impressed on them a chemical stamp which was to affect many scientific fields[3].

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[1] On the far reaching implications of the thought of Paracelsus see Walter Pagel, *Paracelsus* (Basel, 1958), and Walter Pagel, "Paracelsus and the Neoplatonic and Gnostic Tradition," *Ambix* **8** (1960), 125–166. An early English proponent of the view that chemistry is the study of man and of nature or of the universe itself may be found in R. Bostocke. See the present author's "The Paracelsian Compromise in Elizabethan England", *Ambix*, **8** (1960), 77–83.

[2] Frank Dawson Adams, *The Birth and Development of the Geological Sciences* (New York, 1954), pp. 439–441. It was customary in the Renaissance to conceive of the mountains as huge alembics from which issued the mountain springs.

[3] Although much of the Renaissance interest in chemistry was not Paracelsian in origin, the Paracelsians enthusiastically adopted all chemically applications already in use along with adding their own innovations. One field in which chemical thought was used extensively was in regard to the circulation of the blood. See Walter Pagel, "Harvey and the purpose of the circulation", *Isis*, **42** (1951), 22–38; Walter Pagel, "Giordano Bruno: The philosophy of circles and the circular movement of the blood", *J. Hist. Med.*, **6** (1951), 116–124; Walter Pagel, "The philosophy of circles—Cesalpino-Harvey. A penultimate assessment", *J. Hist. Med.*, **12** (1957), 140–157; Allen G. Debus, "Robert Fludd and the Circulation of the Blood", *J. Hist. Med.*, **16** (1961), 374–393. For the development of mineral water analyses see the present author's "Solution Analyses prior to Robert Boyle" in a forthcoming issue of *Chymia*.

With this in mind it is interesting to note the chemical experiment cited by Gabriel Plattes as an explanation of the formation of the earth's features. Of Plattes himself, practically nothing is known. Although he had relatively little formal education, he had at an early age become obsessed with the need to utilize the newfound knowledge of nature for the benefit of mankind—in this he was thoroughly Baconian[4]. Thus he wrote one work to encourage the improvement of agricultural practices[5], while his second work was written so that men might be able to identify valuable ores and minerals themselves. This latter work is his *Discovery of Subterraneall Treasure* (London, 1639) which has been identified as the first useful text in English on metallurgical matters. A description of the assay procedures found in this work has been made recently by Professor C. S. Smith[6].

Plattes held that the earth was in the centre of the universe surrounded by water and air. However, associated with this age old belief may be seen the influence of William Gilbert, for Plattes maintained also that the earth was kept in its central position because of the magnectic attraction—equal in all directions—exerted on it by the celestial bodies[7].

With his interest in practical affairs, he scorned the work of the alchemists[8], even though he stated that natural as well as artificial transmutations could occur. These however, he dismissed as being unprofitable in his day since wages had risen to half a crown a day compared to the penny a day wages of several hundred years earlier[9].

Plattes also turned to the study of the analysis of aqueous solutions because of his interest in the identification of mineral deposits. This was a topic which had been cultivated by Agricola and other metallurgists, but even more

[4] Here he was warmly encouraged by his friend Samuel Hartlib. G. H. Turnbull, *Hartlib, Dury and Comenius* (London, 1947), p. 3. In a letter dated 16 March, 1660, Hartlib wrote that he had maintained Plattes from week to week in his later years. It is interesting that most of Hartlib's group of friends were Helmontians in chemistry. Marie Boas, *Robert Boyle and Seventeenth Century Chemistry* (Cambridge, 1958), p. 55.

[5] Gabriel Plattes, *A Discovery of Infinite Treasure* (London, 1639).

[6] Cyril Stanley Smith and R. J. Forbes, "Metallurgy and Assaying", Chapter 2—pp. 27–71, *A History of Technology*, ed. Charles Singer, E. J. Holmyard, A. R. Hall, and Trevor I. Williams, Volume 3 (London, 1957), p. 63.

[7] Plattes, *Infinite Treasure*, pp. 1–2.

[8] *Ibid.*, fol. a. He complained that the work of the alchemists simply turned into smoke.

[9] Gabriel Plattes, *A Discovery of Subterraneall Treasure* (London, 1639), pp. 40–43. Plattes believed he had transmuted regulus of iron and copper into gold, and he gave his procedure to the reader at this point.

so by the physician mineral water analysts[10]. In England a particularly important analytical work had been published by Dr. Edward Jorden only a few years earlier[11], and Plattes' work described the analysis of an unknown solution. Plattes suggested that in seeking the hidden wealth of a mountain the investigator should

> finde out the Springs of Water issuing out of the said Mountaynes; and those being found, a quantity of the sayd water is to be boiled in a new cleane pipkin, to the consistency of thinne Oyle, but no so thicke as a Syrrup, and when it is almost cold, then to put it into an Urinall, and to set it in the coldest place that can be found for 3 daies, then to play the Physitian, and to observe it exquisitly what residence it yeeldeth: if nothing settle but a black earth or mudde, it is a signe of Coales: if some part thereof shoot into Ice, or a substance like Ice or Vitrioll, then to observe the colour thereof; if it be greene or blewish, it is an evident signe of Copper; if whitish, then it may signifie any other Mettall without exception[12].

Interesting though this description is, Plattes' process is inferior to the procedures in common use by physicians in their quest for the health giving ingredients of spa waters.

Perhaps more significant was Plattes' attempt to account for the formation of the earth's surface by means of a chemical experiment. Here he had once held that rocks and mountains were not an original part of the earth, but rather grew with time like the warts and tumours on man. However, he later modified his views in accordance with the following experiment which he offered to the reader:

> Let there bee had a great retort of Glasse, and let the same be half filled with Brimstone, Sea-coale, and as many bituminous and sulphurious subterraneall substances as can bee gotten: then fill the necke thereof halfe full with the most free earth from stones that can be found, but thrust it not in too heard, then let it be luted, and set in an open Furnace to distill with a temperate Fire, which may onely kindle the said substances, and if you worke exquisitely, you shall finde the said Earth petrified, and turned into a Stone: you shall also finde cracks and chinkes in it, filled with the most tenacious, clammy and viscous parts of the said vapours, which ascended from the subterraneall combustible substances[13].

[10] On the early history of these analyses see the present author's work in *Chymia* already alluded to.

[11] Edward Jorden, *A Discourse of Naturall Bathes, and Minerall Waters* (London, 1631), p. 76.

[12] Plattes, *Subterraneall Treasure*, 9–10.

[13] *Ibid.*, 6.

Thus, as in the retort, in nature the rocks and mountains are formed from the vapours of bituminous and sulphureous substances, while the veins of metals are engendered in the cracks and crannies of the mountains. In this way Plattes utilized the then still current Sulphur-Mercury theory of the formation of rocks and minerals as an explanation of his results. Plattes went on to attribute the formation of hills and valleys to the action of the sea in former ages[14].

The importance of this description does not of course lie in the explanation given by the author. Rather its significance rests primarily in the fact that it is such an early attempt to reproduce geological phenomena in the chemical laboratory. Sir James Hall's experiments to confirm the theories of James Hutton at the end of the eighteenth century are often cited as of basic importance in the development of modern geology, but Plattes' efforts more than a century and a half earlier represent the work of an unheralded pioneer in the same field. This tract by Plattes further illustrates the widespread interest in chemistry which was typical of that era.

[14] Plattes, *Subterraneall Treasure*, 6–8.

## LETTER TO THE EDITOR

### JOHN DASTIN AND THE PSEUDO-ARISTOTELIAN SECRETUM SECRETORUM

SIR,—In his edition of John Dastin's Letter to Pope John XXII (*Ambix*, iv, 1949), Dr. C. H. Josten argues that the shorter version of this text is earlier in date than the longer. The MS. evidence is against this, for the longer version, text (*a*), is in a 14th-century codex, and the shorter, text (*b*), in a 15th-century one. The argument that text (*a*) is "obscure or shows signs of corruption" in the very places where (*b*) is consistent and intelligible is surely also, in fact, an argument (on the principle *Praestat difficilior lectio*) for the priority of the archetypal form of text (*a*). The matter seems to me to be made wellnigh certain by two passages which are concerned with the pseudo-Aristotelian *Secretum secretorum*:

1. The first passage (*loc. cit.*, p. 36), begins in text (*a*) with: "Quoniam ita describit Aristoteles ad Alexandrum", then proceeds to discuss the benefits and therapeutic value of precious stones. Text (*b*) has nothing of this, but in common with (*a*) proceeds with the sentence, "Est enim dictorum verissimum argumentum, quoniam melior lapis omnium lapidum plus [(*a*): melius] valet ad expulsionem omnium infirmitatum". Without the passage in (*a*) the reference in "est enim dictorum verissimum argumentum" has nothing to which it refers back. The quotation in Dastin's letter is remarkably close to the actual passage in the *Secreta secretorum*, as printed in *Opera hactenus inedita Rogeri Baconi*, ed. Robert Steele, fasc. v, Oxford, 1920, p. 114:

| Secretum | Dastin, text (*a*) |
|---|---|
| . . . decorantur regum diademata lapidibus preciosis, quorum pulcritudine visus juvatur, animus delectatur, dignitas ornatur; et eorum virtute gravissime egritudines a corporibus expelluntur, sine quibus parum efficax est medicina, et ideo utuntur medici eis in medicinis ad morbos gravissimos expellendos. | Regum decorantur diademata lapidibus pretiosis, quorum pulchretudine visus iuvatur animus delectatur, dignitas adornatur, et eorum virtute aegritudines gravissimae a corporibus expellentur, sine quibus etiam parum est efficax omnis medicina; et ideo eis utuntur medici in suis medicinis ad gravissimos morbos expellendos. |

2. The second passage includes quotation from the *Secretum* in both texts (*loc. cit.*, p. 41):

| Dastin (*a*) | Dastin (*b*) |
|---|---|
| Unde secundum Aristotelem in Secretis Secretorum, cum habueris aquam ab aere et aerem ab igne et ignem a terra, *tunc habebis totum magisterium*, quia tunc habebis quatuor elementa in parte bene praeparata. | Unde secundum Aristotelem in Secretis Secretorum, cum habueris aquam ex aere, aerem ab igne, ignem a terra, tunc habebis quatuor elementa praeparata optime. |

The actual words of the Secreta (Steele, p. 115) are:

> Quando ergo habueris aquam ex aere, et aerem ex igne, et ignem ex terra, *tunc habebis plene artem.* Dispone ergo substanciam aeream per discreccionem, et dispone substanciam terream per humiditatem et caliditatem donec conveniant et conjungantur, et non discrepent nec dividantur. Et tunc adjunge eis duas virtutes operativas, aquam et ignem, et tunc complebitur opus.

It is surely more likely that text (*a*) is the immediate attempt to give a summarized rendering of this passage, than text (*b*)?

It is interesting to note that the *Secretum* has influenced Dastin's letter to the extent that there is an echo of its title in the opening sentence, in both forms of the text: "Hoc est *secretum secretorum,* impretiabile pretium, opus verissimum . . ." (*loc. cit.*, p. 35).

I am, Sir, etc.,

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## REVIEWS

**A History of Chemistry.** Volume II. By J. R. Partington. Pp. xxiv + 795. With 38 Illustrations. London, Macmillan & Co. Ltd., 1961. Price 105s. net.

This is the second volume, and the first to be published, of a *History of Chemistry*, which, as Professor Partington states in the preface, is intended to be completed in four volumes; he adds the welcome information that the third volume (1700–1800) is in the press, and that the completion of the material for volumes i (up to 1500) and iv (from 1800 to modern times) is in an advanced stage of preparation.

The present volume under review covers the period *c.* 1500–*c.* 1700—a period that, broadly speaking, marks the advent of Iatrochemistry and the beginning of the Phlogistic epoch.

The opening chapter presents a series of biographical and bibliographical studies relating to Leonardo da Vinci, Paul Eck of Sulzbach, Girolamo Cardano and Giambattista della Porta; the "Books of Secrets" of, for instance, Alexis of Piedmont, J. J. Wecker and Leonardo Fioravanti are also surveyed in this "Empirical Prelude". Under the next heading—"Technological Treatises"—the works of Biringuccio, Barba and Agricola represent only a fraction of the numerous metallurgical and cognate texts that are discussed in this chapter, which concludes with discoursive accounts of, for example, the "Books of Distillation" of Michale Puff, Hieronymus Brunschwig, Philip Ulstadt and Conrad Gesner. The succeeding chapters are likewise enriched with a biographical and bibliographical delineation of the subject-matter which is critically discussed under appropriate headings, e.g. "Paracelsus"; "Basil Valentine"; "Van Helmont"; and so on.

In his scholarly treatment of this immense corpus of material, Professor Partington has mainly utilized the chief epochal "names" as focal points—as it were—in developing a schematically representative and masterly exposition of all the major and a great deal of the minor writings and themes appertaining to the history of chemistry of the period A.D. 1500–1700. Indeed many of the chapters are "panoramic" in scope and contents, viz: "The Development of Iatrochemistry" (50 pages); "Francis Bacon and Some Contemporaries" (50 pages); and "Mayow" (60 pages); whilst the chapter on "Boyle" (64 pages) is, in effect, a monograph. The sections on Descartes and Gassendi are further examples of the comprehensive nature of this volume. But it appears to be somewhat incongruent that the final two chapters should also include an account of some of the chemists who flourished later than 1700.

It is stated in the preface that "since Kopp's work, [*Geschichte der Chemie*] published more than a century ago, was also in four volumes, it is clear that a book of reasonable size, bringing the subject up to date and also including full references (which were not given by Kopp), must aim at conciseness whilst at the same time being sufficiently detailed to be of real use". In this connexion, it could perhaps be argued that the history of a science should not omit to co-ordinate the facts and hypotheses unfolded in tracing the development of the science. However that may be, any such criticisms must pale

into insignificance in relation to the outstanding importance and usefulness of the present *magnum opus*.

The copious references are recorded in the footnotes. Lists of "Authors" and of "Periodical Publications" are cited in the preliminaries. The book is well equipped with indexes of names (9 pages) and of subjects (15 pages).

With the subsequent publication of the remaining volumes of this authoritative treatise, we shall owe an increased debt of gratitude to Professor Partington for providing us with the first appearance in the English language of an up-to-date and comprehensive *History of Chemistry*.

D. G.

**Transactions of the Newcomen Society.** Vol. XXXI, 1957-59. Pp. xvii + 356. With frontis., figures in the text and 39 plates. London: Printed for the Society by W. Heffer & Sons, Ltd., Cambridge, 1961. Price 50s.

As the Newcomen Society is primarily concerned with the study of the history of engineering and technology, it follows that the majority of the articles published in the *Transactions* are not within the scope of *Ambix*. But among the contents of the volume, under notice, there are two papers of relevant significance, e.g. "Landmarks in the History of Weighing and Measuring", by C. St. C. B. Davison; and "Cornelis Drebbel: A Neglected Genius of Seventeenth-Century Technology," by L. E. Harris. In these papers we have first an interesting résumé of the subject of ancient weights and measures (illustrated with figs. and plates), and secondly, a critical discussion of important episodes in the life of Drebbel.

An index is, of course, appended to this well-produced volume of the Newcomen Society's *Transactions*.

**The Two Netherlanders: Humphrey Bradley and Cornelis Drebbel.** By L. E. Harris. Pp. 227. With 9 plates. Cambridge, W. Heffer & Sons, Ltd. 1961. Price 44s. net.

In the first section of this posthumously published book, the late Mr. L. E. Harris—who died on 5 April, 1959, in his second year of office as president of the Newcomen Society—has used many hitherto unpublished documents in formulating an assessment of Humphrey Bradley's position in the history of engineering, and he has woven much of the historical background of the period (sixteenth to seventeenth century) into his narrative. The dates of Bradley's birth and death are unknown, and there is no evidence that he ever met Cornelis Drebbel. But the author explains that the reason for including these two Netherlanders (Humphrey Bradley of Bergen op Zoom, and Cornelis Drebbel of Alkmaar) in the same book is because they were "symbolical of an interim period of scientific technology, each in his own sphere . . . and just as Bradley may be considered as the starting point of scientific Fen drainage in England, so may Drebbel be considered a pioneer in scientific mechanical construction".

The author freely admits that he has had to rely mainly on secondary sources, e.g. F. M. Jaeger, *Cornelis Drebbel en Zijne Tijdgenooten* (1922), and Gerrit Tierrie, *Cornelius Drebbel* (1932), in the account of Drebbel which is given in the final section of the book under review; and he does not hesitate to advance

his own opinions in support of his thesis that Drebbel was no charlatan, but, on the contrary, a neglected genius—"a man of restless energy who never confined himself to any one activity except that of being a resourceful technologist with a multitude of strings to his bow". In developing the theme along these lines, Drebbel's so called *perpetuum mobile*, for instance, is interpreted as having never been intended to produce an unceasing "rotary motion" but was, in fact, a form of "perpetual almanack" that he invented as a useful method of gaining the patronage of James I.

It has not been the author's intention, as he tells us, to write the biographies of the two Netherlanders, but to give his own judgment on certain aspects of their work. In these well-written narratives he has certainly attained his objective. The book concludes with a bibliography of (*a*) Humphrey Bradley, and (*b*), Cornelis Drebbel.

D. G.

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## PUBLICATIONS RECEIVED

**Revue d'Histoire des Sciences et de leurs Applications.** Paris: Presses Universitaires de France; (Annual subscription to Great Britain and the Commonwealth, 26s.).

Tome XIII, No. 4 (October-December), 1960.

Tome XIV, Nos. 1 (January-March) and 2 (April-June), 1961.

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